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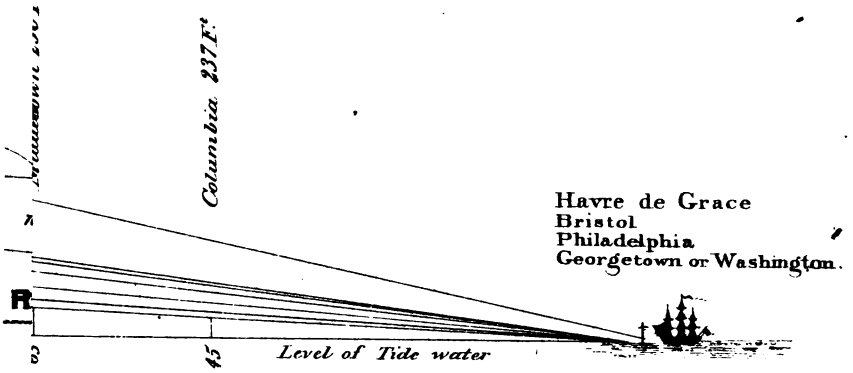

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TWO REPORTS:

ON THE

COAL LANDS, MINES AND IMPROVEMENTS

OF THE

DAUPHIN AND SUSQUEHANNA COAL COMPANY,

AND OF THE

GEOLOGICAL EXAMINATIONS,

PRESENT CONDITION AND PROSPECTS

OF THE

STONY CREEK COAL ESTATE,

IN THE

Townships of Jackson, Rush, and Middle Paxtang, in the County of Dauphin, and of East Hanover Township, in the County of Lebanon,

PENNSYLVANIA.

WITH

AN APPENDIX,

CONTAINING

NUMEROUS TABLES AND STATISTICAL INFORMATION,

AND

VARIOUS MAPS, SECTIONS AND DIAGRAMS,

Chiefly in illustration of Coal and Iron.

Addressed to the Board of Directors of the Dauphin and Susquehanna Coal Company, and to the Trustees of the Stony Creek Coal Estate,

BY RICHARD C. TAYLOR,
PRESIDENT OF THE BOARD OF DIRECTORS.

PHILADELPHIA:
E. G. DORSEY, PRINTER, LIBRARY STREET.
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INTRODUCTORY REMARKS.

It was part of the plan proposed in arranging the following Reports, to give consecutive notices of the various explorations within this district, commencing as far back as 1824. In point of fact this plan was acted upon for a time, and every document in the office of the Coal Company was examined for evidence of the progress and success of the explorers, previous to 1837. It was found, however, that this arrangement, although it introduced much useful and interesting matter, tended to bring the document to such an inconvenient magnitude as to render it expedient to withdraw a material portion of what was comprised under this head. For this reason, if the names of Messrs. Lyon, Kugler, Weiss, Stott, Davies, Young, Jones, and other investigators do not occur in the following pages more frequently, the cause of that omission is now candidly stated, and will, it is hoped, be deemed satisfactory.

We have also to add, that, with the few exceptions designated, the whole series of analysis of the Coal and Iron Ores of this district was made by Messrs. M. Carey Lea and Henry Lea, under the supervision of Professor J. C. Booth, who permits the sanction of his name for their accuracy.

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The Act to Incorporate the Dauphin and Susquehanna Coal Company passed the 5th day of April, 1826.

' It empowers them to hold lands on Short Mountain and Stony Creek, to an extent not exceeding ten thousand acres; and to levy and collect a monied capital not exceeding three hundred thousand dollars. This act to continue in force until the first Monday in March, in the year 1841.

A Supplement to this Act was obtained from the Legislature of Pennsylvania 16th of April, 1838. By this act the charter of the Dauphin and Susquehanna Coal Company was extended to twenty years from the passing of this act: the capital was allowed to be increased to 10,000 shares, of 50 dollars each: to borrow money, for the purposes of a rail-road, to the extent of 200,000 dollars, and to convert the same into capital stock of the company.

* Vide in the Appendix A and B for the Charter and Supplement.

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REPORT

ON THE

COAL LANDS, MINES,

AND

Projected Improvements upon the Estate

OF THE

DAUPHIN AND SUSQUEHANNA COAL COMPANY,

IN THE

TOWNSHIPS OF MIDDLE PAXTANG AND RUSH,

IN THE

COUNTY OF DAUPHIN,

AND OF

EAST HANOVER,

IN THE

COUNTY OF LEBANON.

BY RICHARD COWLING TAYLOR,
PRESIDENT OF THE BOARD OF DIRECTORS.

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The undersigned, to whom was confided the preparation of a Statement of the recent Geological Investigations, and of the present condition and character, and the future prospects of "the Stony Creek Coal Estate," and of "the Dauphin and Susquehanna Coal Company's" Estate, in Dauphin and Lebanon counties, in Pennsylvania, respectfully submits the following

REPORT.

At the commencement of this investigation, our examination originated many miles beyond the eastern boundary of this district, in the direction whence the several coal strata proceeded towards it. It appeared desirable to begin the exploration even as far remote from it as Pottsville, in which neighbourhood all these veins are now so thoroughly understood. From thence westwardly, passing by numerous trial openings in search of coal; and by the instructive sections exhibited in the transverse valleys of the Swatara, Rausch Creek, Lorberry Creek and Fishing Creek, the surest chance existed of tracing the true courses of these veins. We sought the best means of following up and of recognising them in our progress. We endeavoured to determine how many of them were prolonged into the southern division of the coal region; and, consequently, to ascertain how many we might

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reasonably hope to identify within the portion of that region, the field of our labours, now to be described.

This plan was pursued as elaborately as the difficult nature of the intervening country permitted. The result has, happily, furnished us with a clearer insight into the geognostic character of this region than could have been obtained from the opposite course—that of commencing at its western extremity.

The western configuration of this coal field, known as the "First or Schuylkill Anthracite Region," had not then been defined in any published account; and a large portion—the district under our present consideration—had scarcely been recognised by any public document, although locally known to many. It was now ascertained that this coal field, on approaching the Swatara from the east, divided itself into two forks, which were respectively occupied by separate groups of coal strata. These groups diverged from each other at the Swatara, at an angle of twenty-seven degrees. The southern branch, prolonged thirty-five miles, reached the borders of the Susquehanna. The whole of this branch was omitted in the map attached to the Coal Report of the Committee of the Senate in 1834. The northern fork terminated in twenty miles, near the mines of the Lykens Valley Coal Company, at which termination the two coal groups were now ten miles apart. The number of coal seams passing along each branch is probably not greatly dissimilar. A few of them attain a greater thickness in the northern group, which consists wholly of anthracite, chiefly of the red ash kind, and of excellent quality. For nearly half of its length, the coal of the southern branch is also anthracitous; and the

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remainder may be classed with the bituminous coals. This interesting fact, heretofore doubted, is now completely established. In the last five miles of its course towards the Susquehanna, this branch becomes attenuated, and finally terminates the carboniferous formation in a mere wedge or narrow ridge.

The entire area of the land, which now comes under our especial consideration, comprehends the coal region between the Schuylkill county line and the Susquehanna river, a distance of upwards of twenty-five miles. At the latter point, it is eight miles above Harrisburg, seventy-six miles from tide water at Port Deposit, and eighty miles above Havre de Grace.

Restricting ourselves to the description of the southern fork, with which we have here only to do, obvious reasons present themselves in the arrangement of the details which our examinations have supplied, for commencing at the western end, the property of the Coal Company.

It only remains at the present stage to state here, that this investigation was, in the outset, conducted by the geologist over the whole area, without regard or reference to the separate interests of the proprietors of the two estates. Those interests have been subsequently clearly defined and permanently fixed, and will here be separately considered.

There will, nevertheless, be certain matters of common interest, not only to these, but to adjacent coal districts, and other affairs relating to the statistics of the coal trade generally, the consideration of which will, with greater propriety, be reserved for the concluding pages of this report.

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ESTATE OF THE DAUPHIN AND SUSQUEHANNA COAL COMPANY.

This property commences at the Susquehanna river, and extends eastward eighteen miles, as far as the Cold Spring. We may here premise, that although the coal seams and the parallel mountain chains, constituting the southern fork of the entire region, range nearer to a south-west and north-east course than they do due east and west, it will be found more convenient in general parlance, to adhere simply to the four cardinal points.

The area of this estate comprises the space between the summit of Short Mountain and Stony Creek Valley. About fifteen miles of its length is occupied by the bituminous coal formation.

It is seated chiefly within the townships of Rush and Middle Paxtang, in the county of Dauphin, and a small portion extends into East Hanover township, in the county of Lebanon. A detailed schedule of the lands or tracts which compose the corporate estate will be found in the Appendix.

By the terms of the original act of incorporation, passed the 5th day of April, 1826, a copy of which is also hereunto annexed, "the quantity of land to be held by said company shall not exceed at any time ten thousand acres." According to the schedule above referred to, it appears that the amount of lands so held at present by the company, is nine thousand seven hundred and seventeen acres and thirty-eight perches.

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THE VILLAGE OF PORT LYON,

Locally called Dauphin, after the name of the County,

Is advantageously located at the mouth of Stony Creek, in Middle Paxtang township, in the valley of the Susquehanna, on which river it is bordered for the length of two thousand two hundred feet.* The Pennsylvania canal, with locks adapted for boats of 70 to 80 tons burden, passes through it an equal distance, having wharves or canal lots of seventy-five feet wide on each side. The Stony Creek Rail-road is located to this point. The proposed Harrisburg and Sunbury Rail-road is designed also to pass through this site; the route for the proposed Pittsburgh Rail-road passes either through or within one mile of it; and moreover, it is the point of junction of the two principal turnpike roads in this county; and eight miles above Harrisburg the seat of government for the state of Pennsylvania. Its elevation above tide-water, from which it is distant 76 miles at Port Deposit, is 327 feet.

The town plot, a lithographed map of which (No. 148) is annexed to this report, consists of one hundred and sixty-one lots, of which above fifty have been sold, and for the most part are now built upon. They are from fifty to seventy-five feet in width, and from one hundred and two, to two hundred and forty-one feet

* The river is here a mile in breadth, the whole stream being in Dauphin county. In geographical position, Dauphin is situated in lat. 40° 21′, and lon. 0° 9′ east of Washington city.

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in depth. These, from the eligibility of their position, are rapidly increasing in value, as are the other lands of the company in this vicinity.

The fall from the water line of the canal to the river, at ordinary low water, is about twenty-four feet; and from the level of the lower dam or reservoir on Stony Creek to the canal, is $1\frac{85}{100}$ feet more. The company, in disposing of certain water rights and property here, retained the use of the mill-race, dam, and part of Stony Creek, for canal purposes; having thus the option of terminating their coal railway either in the town, on the banks of the Pennsylvania canal, or higher up Stony Creek, within their own property.

We add here a short Table of Distances from this place, by different routes and modes of transportation, to some of the more important commercial points. The Table E, appended to this report, exhibits in detail a more numerous list of places and routes, not only in connection with this station, but in illustration of the statistics of the coal trade of Pennsylvania and adjoining states.

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TABLE I.

	Miles.	
To tide at Port Deposit	76	By Canals and River.
at Havre de Grace	80	By Penna. Canal 35 miles to Middletown; Lockage 94 feet. By Tide Water Canal 45; 29 Locks and 233 feet Lockage.
To Delaware city	118	By Penna. Canal to Havre 80; to Delaware 38 miles; level.
To Philadelphia	159	By Tide Canal, &c. to Delaware 118; to Philadelphia 41; total Lockage 327 feet.
do.	159	By Penna. Canal 17; Union Canal 80; Schuyl. Canal 62; total Lockage 738 ft.
do.	114	By Harrisburg, Lancaster and Philada. Rail-roads.
do.	135	By Stony Creek, Schuylkill Haven and Reading Rail-road.
do.	133	By Stony Creek, Port Clinton and Reading Rail-road.
To Baltimore	85	By Canal and River 25; York Haven Rail-road 60.
do.	103	Canal to Columbia 35; Rail-road 68.
do.	115	Canals to Havre 80; Rail-road 35.
do.	134	Do. 80; Chesapeake 54.
To Washington	153	Havre 80; Rail-roads 73.
do.	123	To York Haven 25; Baltimore 60; Washington 38.
do.	141	Via Columbia, York and Baltimore.
do.	120	Stage and Rail-road route.
To New York	277	Havre 80; Phila. 79; New York Navigation 118.
To Pittsburgh	280	Penna. Canal 138; Portage Rail-road 37; Canal 105.
To Lake Erie—Buffalo	402	To Montezuma 245; Buffalo 157.
do.	366	Elmira 161; by Erie Rail-road 205.
To Lake Ontario	309	Montezuma by Elmira 245; by Oswego Canal 64.
To Albany	451	Montezuma by Elmira 245; Erie Canal 206.
To Hollidaysburg	138	By Pennsylvania Canal.
To N. York & Erie Rail-road	161	Williamsport 88; Elmira 73.
To Erie Canal	245	Elmira 161; Seneca Lake 61; Montezuma 23.

Our diagram, Plate No. 145, further explains the relative position of this place, as the outlet for the bituminous coals of Stony Creek and its distance from tide, as compared with all other coal districts of Pennsylvania.

STONY CREEK AND VALLEY.

An accurate topographical survey of this valley,

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from its source to its mouth, has been recently made by Mr. Edward Miller, C. E., with reference to its capabilities for a rail-road. From the summit level of Stony Creek Valley to the Susquehanna, the length is twenty-one miles and a quarter, occupying the intermediate space between Second and Third Mountains. The greater part of this is wholly under the control of the company, and presents sites at almost every half mile for water power. Like several other adjacent parallel valleys in this county, that of Stony Creek varies so little from a straight line, that in no part of it is it more than six-tenths of a mile from a line running a course N. 67 E., which for the most part is also the course of the coal seams. From the summit level—that is, from the point where the waters of Fishing Creek descend to the east, and those of Stony Creek run to the west—the fall was found by Mr. Miller to be five hundred and thirty-six feet $\frac{33}{100}$ to the level of the water in Port Lyon or Dauphin dam. The greater part of this valley is still a wilderness, without even a path extending further up it than six miles. A portion even of this was made at the expense of the company during the past year. The remainder of the valley, reaching even to the Schuylkill county line, is covered with timber of daily increasing value, which will furnish profitable employment to the sawmills, or for the use of ironworks, hereafter to be erected upon its streams, as well as for the mines on its borders. One of the earliest works to be begun by the owners of these two fine estates, is obviously that of effecting a communication by means of rail-roads or common carriage roads, or both, along the entire length of the valley; thus

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throwing open a heretofore impracticable country, and affording the means of access to those natural productions of its soil, those useful treasures, which still repose, as for ages they have reposed, there, buried, concealed, and unproductive to man. The wants, the energy, and the industry of the present age, will unlock these hidden resources—will for the first time open the avenues for the transmission of the raw materials to our manufactories, and of the fuel to cheer our firesides, and feed our furnaces and steam-engines.

SAWMILL, RESERVOIR, AND EXTRA WATER POWER.

These works were constructed during the year 1839, at six miles up Stony Creek. The approach of winter prevented the entire completion of the mill-work, and it was therefore postponed to the more favourable season of spring, when a short time will suffice to put it in operation.

The reservoir occupies an area of fourteen or fifteen acres.

	ft. in.		*ft.*
Length of the dam, south of the sluice,	212 0	Fall at the race,	3
		Apron in front,	12 wide
Height,	12 3	Do.	60 long
Overfall,	10 3		

This dam contains 94,700 feet of timber and plank, and 1,018 perches of stone, and 213 perches of stone walling more at the head and lower end of the mill.

The mill is 105 feet long, and will saw timber 52 feet in length.

The timber in the mill and the extra race for the machine shop, amounts to 62,000 feet.

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It is estimated that there will be at all times an abundant amount of water in Stony Creek to supply the sawmill, and to furnish an extra power, for which provision has been made, for a machine shop, foundery, or small furnace. In proof of the capacity of Stony Creek, it may be remarked, that the reservoir was filled in about twenty-four hours after the sluice-gates were shut down; and this occurred when the water was in a lower state than ordinary. As the banks of this mountain stream, from hence upwards, are constantly shaded by evergreen trees; as it is fed by strong and never failing springs; and as from the stony character of a large portion of the surface of the valley, it is not likely ever to be extensively cultivated, the supply of water is less influenced or diminished by evaporation during the summer's heat, than in most streams. The circumstance is adverted to as a favourable characteristic of Stony Creek. Numerous positions, equally adapted for water power, may be selected on its course. Besides these there are two ancient mill seats purchased with the lands of the company, at the respective distances of one and a half and three miles up Stony Creek Valley.

TIMBER.

We have already made allusion to this portion of the productive property of the company, and shall notice the subject further when we come to report specially on the resources of the Stony Creek Coal Estate.

From the site of the company's sawmill and water power establishment, to the boundary of its lands in

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the valley of Stony Creek, a distance of nine miles, it has the sole command not only of that stream, but of the best timbered lands on each side; for in making the surveys under the respective original warrants, especial attention was paid to the selection of all that contained good timber. This circumstance explains the cause of the otherwise singularly irregular line which forms the company's southern boundary.

In the flats, where Rattling Run joins to Stony Creek, is a considerable body of very fine timber. The lowest and best is of course that which borders the creek, and averages about a hundred rods in breadth. This area consists of very heavy timber of various kinds; amongst which the poplars, hemlocks, white pines, white oaks, and chestnuts are the most important.

The next bench, ascending on either side, is stony, and contains chestnut, poplar, pine, both white and yellow, black, white and red oak, and birch. They are still abundant, but not so large as on the lower bench: the poplars are beautiful and numerous. On occasional slopes, and on the borders of the gaps, is seen a full growth of young pines, chestnuts, poplar, and black oak, averaging, probably, thirty or forty years of age; amongst them are mixed some very large ancient white pines and poplars.

The third bench contains chestnut, white pine, and a few chestnut-oaks, birch and poplar; but shews traces of the frequent fires that have traversed the mountains, and have injured the quality, and checked, if not destroyed, the timber thereon. Then follows a numerous succession of benches, reaching to the very summit, more than a thousand feet above Stony

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Creek, covered every where with a stony debris, and possessing a scanty crop of timber of little value. Were it otherwise, it would seem almost impossible to collect and carry away the trees on these rugged slopes. The summit flats on the Short mountain and between the two ridges, have a considerable growth of yellow pine, which will be of great value as pit wood; but in the swamps and moist places where the fires cannot reach, there is a large quantity of hemlock, poplar, oaks, and soft wood trees.

So great has been the demand for lumber, and for any accessible timber that would serve the purposes of ironworks, that the neighbouring counties have been pretty well laid bare. The accidental fact of there existing no road down Stony Creek Valley, and the otherwise utterly impracticable nature of the ground, has fortunately led to the preservation of the timber there. At the present time, therefore, it has the reputation of being the most valuable white oak valley remaining in the country. This description of lumber is acquiring a constantly increasing local value, from its acknowledged scarcity and from its contiguity to improving markets. For boat plank and ship building, rail-road stuff, bridge building, &c., for which purposes Stony Creek Valley presents abundant materials, a constant market can always be found below. Besides the tracts above named, there are some equally good below the sawmill, particularly the grass tract, No. 109, which is a first rate timber tract, and also is good agricultural land.

For pit timber, there is scarcely an acre of the ten thousand which does not bear an ample supply for any extent of colliery works.

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STONY CREEK RAIL-ROAD.

The necessity for effecting an efficient communication between certain points in the coal region and the Pennsylvania canal, has led to more than one examination of the ground. In August, 1827, a survey and series of levels were taken from the coal veins of Rausch Gap to the dam of Green's mill, by James Stott. The total fall is reported to be 782½ feet in twenty miles and 484 yards. Average descent from the coal mines to the canal 38½ feet per mile. In 1830, Andrew Young made a similar exploration from the coal in Rattling Run Gap, twelve miles above Port Lyon or Dauphin Dam, and found a practicable route, with a moderate grade, down the valley. Mr. Stott's survey from Yellow Springs, sixteen miles to the canal, shews a descent of 1,022 feet from the old coal openings there. The present opening, somewhat lower, into the same vein, is shewn by Mr. Miller to be 992.60 above the dam.

Mr. Miller's Report to the President and Directors of the Dauphin and Susquehanna Coal Company, dated July 24, 1839, shews that the average grade, were it practicable to adhere to it, from the summit of Stony Creek to the dam, is 25 $\frac{3}{10}$ feet per mile. That part of the route which was actually located, extended from Rattling Run to Port Lyon Dam. A portion of the details of this survey we shall proceed to extract.

"The distance from the Pennsylvania

Canal to the head of Dauphin Pool, is	2,100 ft.
From the latter point to Rattling Run, by the experimental survey, is	65,180
Thence to Yellow Springs Run,	18,165

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Thence to Cold Spring,	11,100 ft.
Thence to Rausch Run,	12,300
And thence to the summit from whence the water flows into Fishing Creek,	5,755

Total distance from the canal to the summit, 112,500 feet, or $21\frac{31}{176}$ miles.

"The summit is $536\frac{333}{1000}$ feet above the surface of water in the Port Lyon or Dauphin Dam, and the fall of the stream in each mile, commencing at the latter point, is as follows:—1st mile, 20.358 feet; 2nd, 16.984; 3d, 15.691; 4th, 16.003; 5th, 15.920; 6th, 31.889; 7th, 26.928; 8th, 56.126; 9th, 46.160; 10th, 36.058; 11th, 7.522; 12th, 28.727; 13th, 39.553; 14th, 18.602; 15th, 7.820; 16th, 4.813; 17th, 20.659; 18th, 4.759; 19th, 16.301; 20th, 40.758; 21st, 32.216; to summit, 1,620 feet; rise 32.391 feet.

"The height of the coal in the Reliance Drift, at Rattling Run Gap, above the water in Stony Creek, at the mouth of the run, is 230.8 feet; above the Dauphin Dam 572.694 feet. The tunnel driven into the Perseverance vein at the same gap, is 269.203 feet above the Reliance drift. The height at which the coal is (was formerly) opened at Yellow Springs Gap, is 619.08 feet above the water of Stony Creek, opposite, and 1003.6 feet above the Dauphin Dam. The lowest point at which the coal was opened in Rausch Run Gap is 250.7 feet above Stony Creek, opposite, and 743 feet above the Dauphin Dam.

"Stony Creek is very direct in its course, and lies in a red shale valley, between the Second and Third (or Sharp) mountains. As the name denotes, the surface of the valley is exceedingly rough, being in some positions entirely covered with large fragments of hard

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conglomerate and sandstone rocks, the debris of the strata which form the mountain ridges on each side. The form of the country does not permit us to adopt such a grade as would be the most advantageous possible for a coal road; nor even to equalize throughout the total amount of elevation to be overcome. It permits us, however, to make a very good road, in point of curvature, and a singularly cheap one, when the general features of the country are considered.

"The best grade for a coal road is determined by the kind of cars employed, and the relative weight of a car and its load. If the wagons are well built and fitted with springs and outside bearings, (which they always should have,) the relative weight of the empty and loaded train will be as one to three. In this case, the best grade is 17½ feet per mile, on which the engines will draw as many empty wagons up as they can take full ones down.

"The average fall from the head of Stony Creek to the canal, is 24.711 feet per mile; from Rausch Run to the same point 23.887 feet per mile; from Yellow Springs Run 24.633 feet per mile; and from Rattling Run 27.578 feet per mile. Either of these would be favourable gradients; but they cannot be obtained except at a great cost, on account of the irregular fall of the creek, and the manner in which the bases of the Sharp and Second mountains are gullied, near the western termination of the valley.

"As located from the dam, the line is confined to the narrow flats of the stream for four miles, crossing several times on bridges, to reduce distance or avoid objectionable curvature. The grades on this portion vary from a level to 21 feet per mile. It then leaves

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the stream, and clings to the side of the Sharp mountain for 6½ miles, with a grade of 37 feet per mile, which brings the road at one point 40 feet above Stony Creek. By leaving the flats, the expense of construction is materially increased; but the irregular fall of the stream (which varies from 16 to 56 feet per mile) is avoided. At the upper end of the steep grade we pass into one of 21 feet per mile, which is continued to Rattling Run; and may be extended, at a future day, on ground of a very favourable character, without change of inclination, entirely to the summit.

"A branch road, with an inclined plane, has been located at Rattling Run." "I have already said that the ground between Rattling Run and the summit is favourable for the construction of a rail-road. Our examinations did not extend further eastward; but I think there can be little doubt that the extensive anthracite fields lying within Goldmine and Black Spring Gaps, can be made available by a rail-road in the Stony Creek Valley, more cheaply and efficiently than by any other route."

"In a late Report upon the Sunbury and Erie Rail-road, I have demonstrated that such locomotive engines as are now employed on the Columbia road, are capable of transporting three hundred tons, exclusive of the engine, on a level; and that if the statements of the respectable engineer and superintendent of that work may be credited, they are in the common custom of much greater performances.

"On the Dauphin and Susquehanna Rail-road, the trade will consist chiefly of the product of the mines; and the cars, if made in the best manner, will weigh 1½ tons, and carry three tons each. The steepest grade

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ascending to the mines is seven-tenths of a foot in one hundred feet, or thirty-seven feet per mile. This rate of acclivity cannot be materially diminished except at a great expense; and it will form the limit of the engine's load, which will be upon it 94$\frac{7}{10}$ tons. Deducting the weight of the tender, we have 90 tons for the effective load, equal to sixty empty cars. These cars would carry, when descending, 180 tons of coal; making a gross load of 270 tons, exclusive of engine and tender; and there is no part of the road on which a greater weight than this could not be transported westward. On one half of the ascent only, would the engines be working up to their power; while on nearly the whole of the descent the trains would run by gravity alone.

"A circular trip (from Rattling Run Gap) will be about twenty-five miles; and as the engines will be working generally within their power, each can make four trips per day, readily. One locomotive, therefore, (with a second in reserve,) will transport 720 tons of coal per day, or 180,000 tons per annum, supposing the road to be worked only 250 days, or while the canal is in operation. If a first rate iron road be made, the sum of 43,872 dollars* will cover every expense incident to the transportation of 180,000 tons of coal per annum, from the head of the inclined plane at Rattling Run to the canal, together with the delivery of it into boats. It is equivalent to 24$\frac{37}{100}$ cents per ton for the whole distance, or to 1$\frac{84}{100}$ cents per ton per mile, the distance being 13$\frac{1}{4}$ miles."

* The details are furnished in the original; but for the objects of the present Report, it is considered sufficient to state the gross amount.

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"If a plate-rail superstructure be adopted, there will be an *apparent saving* in the first cost of 4,185 dollars per annum, equal to $2\frac{334}{1000}$ cents per ton on the above amount of trade. The maintenance of way, however, would be more expensive; accidents would be numerous; and the engines would do much less work. If there be trade sufficient to keep two locomotives in constant employment, the *nominal saving* will be only $1\frac{1634}{10000}$ cents per ton; and it will of course diminish in the same ratio with every augmentation of trade, while the *actual loss* on repairs and transportation, increases in a much more rapid ratio.

"Many of the expenses incident to a good road will remain the same, or be but moderately increased, by an advance of business. For example—if two locomotives were kept in constant employment, we should have an expenditure of 63,732 dollars,* which would be sufficient to transport 360,000 tons of coal from the head of the plane, and to deliver it into the boats at Port Lyon. It is equal to $17\frac{703}{1000}$ cents per ton for the whole distance, or $1\frac{334}{1000}$ cents per ton per mile.

"When the road is extended up the valley of Stony Creek, so as to accommodate the extensive anthracite tracts in its vicinity, the cost per ton per mile will be diminished; for it is easy to perceive from the above statements, that a considerable portion of the expenditures is incidental to the shortness of the road, and that the relative cost of transportation will diminish with the increased length of line as well as the augmented trade."

The Engineer's Report contains much other matter

* The details are necessarily omitted for the previous reasons.

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in connection with the expenditures and costs of transportation; the arrangements for the delivery of the loaded cars at the termination of the road; the shipment of the coal at the wharves; tables of gradients and of curvature, of excavation and embankments, &c., all of which, although very essential in themselves, and worked out with great precision and ability, we are constrained to omit here.

DAUPHIN AND SUSQUEHANNA BITUMINOUS COAL DISTRICT,

Short Mountain,

Commences at a bluff or point, distant a mile and a half from the Susquehanna, and forms an elevated ridge, gradually increasing in height and breadth, until after passing the Big Flats at nine and a half miles from the river, it assumes the form of *two* parallel ridges or mountains, separated by a series of elevated longitudinal valleys, the drainage of which passes through the transverse ravines or gaps which occur at intervals of about three miles, and empty into Stony Creek. It is an important geological feature of this region, that whilst the northern ridge continues unbroken, not only through this property, but for thirty miles in its range to the Swatara coal region, the southern ridge is cut through to a considerable depth in many places; thus affording ready modes of access to the coal veins within the basin. By means of a continuous rail-road along Stony Creek Valley, forming the main trunk, and by lateral roads descending thereto from the respective gorges, much of the coal of the upper valley can be obtained upon the system of open drifts or adits.

From the gap of Rattling Run the main veins may

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be intersected at about five hundred feet below the summit of the ridge on either side. From that of Yellow Springs the coal seams in the present openings have a breast of upwards of 300 feet perpendicular height above the run there; but they can be worked 100 feet lower when the works of Rattling Run can be pursued so far eastward. As these veins are inclined at different angles, the real depth or breast of coal is of course much more than these vertical heights, and varies according to their respective angles of inclination. Whenever the time shall arrive when the coal, procurable by means of the present adits, shall be exhausted, other modes suggest themselves for reaching it at greater depths, either by means of shafts and steam-power, or by transverse tunnels or adits, intersecting the strata at greater depths, from the south side of the Third or Sharp mountain. Those veins which are known to exist on the Fourth or North mountain will be mined upon the same principle also from the south.

The elevation of this range, near the Big Flats, is 1,350 feet above the Susquehanna river, 1327.75 feet above the level of the Pennsylvania Canal, and 1,654 feet above tide water level in Chesapeake Bay. Sharp mountain appears to maintain this height with some regularity. Fourth mountain preserves an increased elevation, probably of 100 feet more. The series of transverse sections, in our Plate No. 147, will illustrate these and other characters of the region under examination.*

* A line drawn in the longitudinal direction of Short mountain, within its two outer ridges or limbs, forming the Third and Fourth mountains, will exhibit, when protracted, a series of ascending and

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The group forming this carboniferous series, rests upon red shale and red sandstone beds, along which the adjacent valleys of Stony Creek to the south, and

descending planes. These planes evidently originate in the wearing away of the broken and soft strata in the centre of the basin, by the water which arises within it and escapes through the gaps. The prevailing feature in each pair of planes is this:—there is one long branch or rivulet descending from the west, and one short one coming from the east. Their point of junction is in one or other of the transverse ravines in the Third mountain, and the united waters suddenly turning at right angles, pass to the south. The intermediate elevations between the opposite planes form summit "flats," where the area between the Third and Fourth mountains maintains a uniform transverse level from side to side, or exhibits but a slight central depression; thus preserving at these points and clearly indicating its original character, that of one single mountain. This fact explains certain local difficulties in regard to names; for it may be said with equal truth, under its present aspect, to constitute one mountain at the summits of these planes, and two very distinct mountains at the points opposite to each gap. Between the Big Flats and Lorberry Creek, a distance of twenty-two miles, there are six pairs of these planes, always maintaining the same character, that of a long western slope and a short eastern one.

Let it be borne in mind, that it is not solely on account of any supposed geological or scientific interest appertaining to them, that we have noticed these and other physical features of this region. However unimportant they may seem, it must be admitted, that upon a thorough knowledge of such details depends the means of discovering, of opening, of draining, and of extracting, in the most effective and profitable manner, the mineral wealth of these same mountains.

The respective heights at which the best veins of coal are intersected, by means of the Sharp Mountain Gaps, are as follows:

Depression at the six mile openings, 900 feet above the canal.

Gap at Rattling Run,	574 to 740	do.
Gap at Yellow Springs,	750 to 993	do.
Rausch Gap,	650 to 730	do.
Gold Mine Gap,	770 to 870	do.
Black Spring Gap,	800 to 845	do.

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of Clarke's Valley to the north, have their course. These again are bounded to the north and south by the parallel external ridges of sandstones, grits and conglomerates, which constitute the Second mountain and Peters' mountain, and which same series are repeated on either side of the North Fork or Lykens Valley and Bear Valley previously alluded to; and on that of the Mahanoy anthracite region yet farther to the north. To the undulating character of the whole of this portion of the state, produced by the alternate elevations and depressions of these vast stratified masses, may be attributed the frequent re-appearance of the same series and the prevailing uniformity of the mountain ranges. The limited space afforded in a document like the present, will not admit of our going beyond this passing notice of a geological fact now well understood, and on the present occasion not requiring our particular attention.

WESTERN EXTREMITY OF SHORT MOUNTAIN,

A bluff or point commencing a mile and a half from the Susquehanna.

We perceive here a nearly perpendicular wall of extremely compact siliceous conglomerate, ranging with the ridge at the distance of 100 feet south of its crest, and apparently 20 or 30 feet thick.

This position is one of the earliest to which attention was attracted in regard to the discovery of coal in Pennsylvania; the application for a warrant of survey being dated 24th of February, 1768, and the land subsequently patented under the name of "Musser's Treasure." We have received local information from individuals whose recollection enabled them

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to speak of the coal trials here about fifty-four years ago. About the year 1802, it is stated that two boat loads of the coal obtained from about a mile east of the point, were sent down the river to Harrisburg and to Baltimore on trial, "as it was a novelty," and was then ascertained to be bituminous. Other researches were soon after made by boring to the depth of 142 feet perpendicular, and these examinations were renewed in 1824 by the predecessors of the present company.

Abundant traces are visible here, in the numerous excavations, of the labours of the early explorers in search of solid coal.

Notwithstanding all this labour and perseverance, by boring, sinking and driving, no regular workable bed of coal appears to have rewarded the toil attending the research. This result is readily explained by the contracted state of the "coal bearing" series, which is here altogether "running out."

Whether or not any part of the intervening ground may offer more favourable prospects we have not sought of late years to determine; but without stopping to expend money and time on the intervening portion, the company have, for the present, satisfied themselves with passing on to six miles from the Susquehanna, and to making a very slight examination of the works entered into there fourteen years ago.

Examinations on a small scale were formerly made near the end of the mountain, and continued eastward, at intervals, for four or five miles. Beyond that we have evidence of much laborious search, where the indications of coal appear abundant. We found here, in the length of one mile, three or four drifts, and up-

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wards of one hundred and twenty old exploration shafts; none of them apparently of material depth, yet shewing in most the traces of coal seams. It is obvious that the mountain is still too contracted to admit of the existence of undisturbed coal beds. As the strata dip towards each other, there is obviously broken ground in the centre; but in proportion as the area expands, we have reason to expect the continuation of the coal beds, in a more regular state, as we advance eastward.

SIX MILE EXPLORATIONS.

The entire breadth of the coal measures in the depression of Short mountain, wherein the numerous trial openings have been made in 1826 and 1830, is about 1,500 feet. The strata assume a basin form, dipping from either side towards the centre, at from 20 to 30 degrees, and flattening in the centre. Two veins of excellent coal were opened here on the south side, and one on the north side. To these we must briefly advert.

The North Vein. Opened in 1827, in the pitch of the vein 100 feet, dip S. 30 degrees. Roof, hard sandstone and regular. This work being filled with water, has remained almost unexamined. No longitudinal drifting in this vein was attempted, but some tons of the coal were raised, and it is very probable, as the mountain rises 200 or 300 feet eastwardly, that if a more suitable mode of working were adopted, the result would be satisfactory.

The specific gravity of the coal of this vein is 1.330, which would produce one ton and four pounds in weight to every cubic yard.

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It burns with a white flame and yields a reddish ash; swells slightly, and cements or cokes in a moderate degree.

Three other crops of small veins have been since proved on the north side of this mountain.

SOUTH SIDE OF THE SHORT MOUNTAIN.

Young's Drift. A bed of coal opened in 1831, from whence thirty tons were brought down to the landing. This drift was carried 117 feet, the vein at first pitching about 25 degrees to the north, or the reverse of that on the north side of the mountain. By the details in our possession, this vein varied in thickness from 17 to 51 inches; and no better coal has been discovered. It is a distinct vein from that on the north side, as is shewn by its different structure and appearance, and the nature of its roof and floor. It burns, like that, to a red ash, attesting the presence of a certain portion of iron, in sufficient quantity to colour the residuum.

Analysis of 100 parts, by William H. Ellet, M. D., Columbia College, New York.

Carbon,	75.5	
Bituminous matter, burning with flame,	15.3	a trace of oxide of iron.
Earthy matter, silica and alumine,	9.2	no trace of sulphur.

Specific gravity, by R. C. T. 1.330, or about a ton to a cubic yard.
1.369, by Marcus Bull.

This vein, as it approached the centre of the basin, thinned off to 17 inches. In an examination in 1837, there being much difficulty in freeing the works from water, it was not thought advisable to continue the exploration.

Kugler's Drift. Opened in 1824, by Mr. Lyon, and

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continued in 1825 by Dr. Kugler, in a vein about 25 feet below the last, and about 80 feet below the summit. This drift was pursued 190 feet, and 33 feet of boring. In some places the vein consisted of four or five feet of good coal; at others it was greatly reduced in thickness and mixed with slate; as might be expected so near the outcrop.

No recent examination of this vein has taken place. There are several old shafts ranging along the outcrop of this vein for above half a mile.

The same remark applies to the south veins, with regard to regularity and area, as we have made to those on the north side.

As a colliery station we can scarcely, in the present stage, calculate upon this position for the establishment of a principal work; but the time may arrive when its eastern vicinity will furnish a certain quota to swell the general amount within this estate.

Little Vein occurs about 20 feet below the last, and is 18 inches thick. We cannot speak of this vein from personal observation, as its traces are obscured by fifteen years exposure to the elements.

Iron Ore. At some 50 feet below the last, occurs a bed or stratum of red siliceous iron ore, varying from two to three feet thick, which will be referred to more particularly at another part of this report.

There were many other old excavations in search of coal veins in this vicinity. In one position the two principal south coal veins are opened half a mile west of this depression; and another trial was made in 1831 about three miles from the western point.

We are not solicitous to attach unnecessary im-

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portance to the early examinations to which we have briefly alluded; inasmuch as at that period the operating parties were entering upon untried ground, and had yet to become familiar with the most advisable modes of proceeding. On this account, therefore, the results attending the first investigations of persons, who, whatever might be their qualifications, had, as regards this locality, every thing to learn, and numerous unforeseen difficulties to encounter at every step, are not so sufficiently conclusive or satisfactory as are demanded by the business men of our times. Nevertheless, they are not without interest when narrated by the explorers themselves, on the very scene and at the very period of those operations, while every circumstance was fresh in their memories. We cannot introduce those details into our pages. Yet we may be permitted here to say, that they present a record not entirely valueless, of the labours, the hopes, and the successes of those gentlemen who expended so much time in the early investigation of this coal region.

It would tend greatly to instruct those who are concerned in examinations of the like nature elsewhere, could they oftener consult records, faithfully given, of the operations, whether successful or otherwise, which are pursued in our mineral districts. Such documents would impart much useful practical knowledge; would save to the proprietor much unnecessary charge; to the explorer many difficulties; while to the geologist it would supply a fund of facts whereon to base his inferences; to avoid the embarrassments that impeded his predecessors, or to teach him the indications that conducted them to success.

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Prospects of the above described portion of the Bituminous Coal District.

The four or five miles of length, which constitute this western area just noticed, possess not more than 1,000 or 1,200 feet in breadth. We are reminded by many circumstances, that the main productive coal region, has here approached its western termination. The strata are seen cropping out towards the west one by one, and step by step, until there is no longer an area capable of containing an important amount of unbroken coal. Under such a state of things, an unsettled, disturbed condition of the stratified masses must be looked for; and, so far as we have seen, exists here. I believe that no practical observer will dissent from the doctrine that coal seams occurring near the extremities of ridges, and the terminating wedge-like points of coal fields, particularly in such acute troughs as that of Dauphin, are always influenced by local derangements, which deteriorate the coal, disturb the regularity of mining operations, embarrass the workman, and disappoint his employer. I do not proceed directly to the inference, that in this case, no coal seams of a workable description, (using the phrase always in its operative sense,) exist. On the contrary, it has been suggested that they may be looked for with reasonable grounds of success to the eastward of the six mile openings.

With regard to the more recent explorations to ascertain the eastern prolongation of the veins previously enumerated, we have few particulars to add.

A drift has been commenced on the mountain road side at 6½ miles from Dauphin, in the red shale, for the

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purpose of intersecting the red siliceous iron ore before mentioned.

At 6¾ miles, and at 7¼ miles, two tunnels have been commenced, to prove the lower carboniferous beds, previously noticed. These may be pursued at any future period, and offer the best means of proving the continuation of those beds.

Bear Town. An elevated rocky expansion of Short mountain, forms an oval about 1½ miles long, at the distance of from 6½ to 8 miles from the canal, and 1,250 feet above it. A four feet vein is spoken of here, traced in 1825. In 1831, several outcrops were ascertained. One of them a five feet vein, on the summit, and three smaller veins on the south side of the mountain. Since that period no exploration worth mention has been made. There is reason to believe, that from the expanded area hereabouts, some quantity of bituminous coal can be drawn; the operation for which will, on some future occasion, be performed by extending the tunnels last mentioned; but irregularities must always be looked for.

Fort Look Out. Seven miles and three quarters from Dauphin. It is 1,293 feet above the canal; 1,312 feet above the Susquehanna; and 1,620 feet above tide water. Numerous small pits, made in 1825 and 1826, exhibit the outcrops of three or four coal veins near the summit. In 1838 a shaft was sunk to the depth of 82½ feet, chiefly through very hard rock, to prove one of these veins, reported to be four feet thick on the mountain summit; but as the ridge is again contracted here to 700 feet, it is evident that the strata have been disturbed in the same manner as in the gaps. A small stream takes its rise here in the broken strata, and has

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formed occasional deposites of bog iron ore, on spots down the southern slope of the Short mountain.

The Big Flats. Extend two miles in length. The highest part is 1326.75 feet above the canal. At 9¼ miles from the latter, the coal company made some important explorations in 1838, near the site of old trials, from which the early explorers had been driven by the excess of water. The elevation of these works is 1309.6 feet above the canal, and 1,636 feet above tide. They consist of several shafts, from one of which several hundred tons of coal have been raised and brought down to the landing. The dip of the coal here averaged about 18 degrees to the north. This work consisted of a trial shaft of 46 feet 8 inches in depth; a working gin shaft 42 feet deep to the lower coal; and a pump pit or north shaft 49 feet down to the same vein. Two or three other veins were intersected by these shafts, but have not been examined further. The lower vein varied in thickness from 20 inches to three feet. This is an excellent pure coal, easily mined; its principal disadvantage being the amount of water accompanying the vein, but which may easily be overcome. Its analysis by M. C. Lea, under the supervision of Professor Booth, is as follows:

Carbon,	71.20	Another analysis by J. C.
Volatile matter,	15.32	Booth, gives of volatile matter
Ash,	13.46	16.9 per cent.

It has a slate roof and hard rocky floor, and was worked out on both sides the shaft, according to the water level course, S. 80½° W. to the extent of 125 feet, and N. 77° E. to 110 feet. This coal was not hauled down to the canal until recently, and after

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lying a year on the bank, its weight is probably something less than the average will be found in future working of the fresh coal. Twenty-eight bushels, carefully measured and weighed, amounted to 2,199 pounds. The average weight of a bushel of the Big Flats coal is therefore 78½ lbs.; and the number of bushels to the ton is 28½.

Its specific gravity is 1.395, and the weight of one cubic yard is one ton and one hundred and eleven pounds.

At this place the summit flat and the coal formation is about 2,500 feet wide. We fixed the position of the gin shaft, No. 2, to work the summit veins, and timbered it down to 39 feet. Two other shafts, No. 3, were also timbered to 42 feet. One other trial shaft was 27 feet, another 10 feet, another 15 feet, in which small coal crops were seen. These details are illustrated by the cross section, No. 147, Fig. 1.*

* The drainage plane of the Rattling Run, commences at a short distance east of the Big Flat mines, and descends 600 feet, in three miles, to the gap, and from thence 400 feet more to Stony Creek. We cannot refrain from noticing this striking and characteristic specimen of a mountain valley. We perceive a vast bed of subsided conglomerate and sandstone masses, spread along the centre of this longitudinal plane, of the breadth of 200 yards, and bearing resemblance to the bed of a mighty torrent. In its central part, averaging 100 yards in width, we see no vegetation; for no soil exists between the interstices of the rocks; while the rushing or "rattling" of the stream is heard many feet below. The history of this belt of broken materials, locally known as "the Devil's Race Course," is easily traced. In the present instance, the sides of the trough or basin dip towards each other like the letter V. It is apparent, that although the quantity of water descending has been insufficient to carry downwards longitudinally, or to boulder the large rock fragments, and has probably never exceeded its present

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RATTLING RUN GAP.

Thirteen miles from the Susquehanna, and about the same distance from the county line of Schuylkill. Its cross section is given in draft No. 147, Fig. 2.

This gap is the deepest on the estate, and the nearest to tide water; and as it had not previously received a satisfactory examination, a thorough investigation was devoted to it during the past year. More than two hundred trial shafts were sunk in proving the ground, and more difficult ground for such operations could scarcely be found.

Five tunnels or drifts have been carried partly through exceeding hard grit rock and puddingstone, and partly in coal and slate.

The Reliance drift is 461 feet under cover, and the Perseverance drift is 500 feet at this time. These works are of the most substantial character, having rail-roads laid down in them.* Four air shafts are sunk to ventilate these drifts; one being 82 feet and

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volume, yet that the softer materials by which they were surrounded, have, in the lapse of ages, been scooped out and carried away; until in our own times a gorge 2,500 feet wide, and many hundred feet deep, presents itself, which once was filled to the margin by its ancient materials. As might be expected, we find all the central portion of the mountain valleys is in a broken condition. A series of six trial shafts across it, 1¼ miles beyond the Big Flats, was wholly unsuccessful in reaching solid strata. The same was repeated near Mount Eagle, the shafts all terminating in quicksands; thus proving the small chance existing for discovering coal strata in this position; nor does it appear that coal veins have yet been seen along this parallel, as far eastward as the Swatara river.

* Area of the timbered parts of the drifts:—top, 4 feet 6 inches; bottom, 6 feet 6 inches; height, 6 feet 4 inches in the clear; sleepers, 8 inches thick; string pieces, 12 feet × 6 × 4 inches; width between the rails, 40 inches. For cars to carry one ton, at least.

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another 122 feet deep. The aggregate depth of shafts and trial pits, sunk in the immediate vicinity of this gap, as shewn by detailed maps and sections in the company's office, is upwards of 3,000 feet.

The result of all these explorations is the ascertainment of twelve small coal seams on the south side of Sharp mountain; four small veins towards the centre of this mountain; two veins of good promise on the north slope of the same mountain; and the outcrops of two or three veins on the south slope and summit of the Fourth mountain. The sixteen Sharp mountain veins vary from one foot to three feet in thickness in the trial pits; yet cannot, from the knowledge acquired of them, be denominated, at the present moment, good workable veins. Those mentioned as occurring on the north slope of the Sharp mountain, are of a more satisfactory character, as regards the capacity of coal. One of them, the Perseverance vein, along which a drift has been carried about 400 feet, besides 105 feet of tunnelling and 53 feet of deep cutting, has, up to April, 1840, been divided into two by a seam of slate, which varies from six inches to three or four feet. The south portion of this vein measures, on an average of thirty-three admeasurements, in the first 300 feet, 2¾ feet of coal; and the northern portion measures 1½ feet; in all, 4¼ feet of coal. After pursuing the vein above 400 feet, the exploration was considered sufficient to determine its character; and the aggregate thickness of the two veins, when the work was suspended, was 5½ feet—the small seam being 16 inches, and the large one 4½ feet thick.

Specific gravity, 1.391, being equal to one ton and one hundred and seven pounds weight, to each cubic yard.

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The level of the Perseverance tunnel is 844 feet above Dauphin dam; but it can be opened at about 740 feet.

At 37 yards to the north of the Perseverance vein, a drift is now in progress along a coal vein which appeared to promise well as a workable vein, judging from the trials previously made along the crop. This coal can be opened at 770 feet above the dam. This drift is 141 feet under ground: the vein at this point is very thin; but in a trial shaft 300 feet further eastward, there was a thickness of 5 to 8¼ feet of coal smut, in disturbed ground.

The *Reliance Drift* is in the sixth coal seam north of the red shale, and at the head of the inclined plane, 572 feet only above the dam. The extension of this work did not result so favourably as the early appearance at the pits on both sides the gap led us to anticipate.

There is a coal crop 20 feet to the south, and another 40 feet to the north of this drift: it is proposed to cross-cut into these veins from below in the drift, where it has above 100 feet of covering.

On the Fourth mountain, the trial pits, after many obstacles occasioned by the vast amount of slipped rock, shewed one vein of 3½ or 4 feet, and the crops of one or two more, of uncertain size. From the summit and downwards, on the north slope of this mountain, no examination has been made; but there is reason to think coal veins do exist in that position, dipping 45 degrees towards the south, to meet those of the Sharp mountain, which dip 74 degrees to the north.

As before intimated, the advantageous position of Rattling Run Gap, rendered it, in the opinion of those having charge of these investigations, deserving of the

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most careful examination; and appeared to call for and justify an unusual application of labour and research after bituminous coal. Accordingly, during a portion of the last year, as great a mining force was concentrated here as was compatible with the means of supplying and accommodating the workmen; there being at the outset, neither road, nor path, nor shanty, within many miles. The result of these operations, if it does not exhibit so many workable veins as their outcrops indicated, has been so far satisfactory in establishing a knowledge of some that contain an amount of coal, of a very valuable description, fully sufficient to justify the further expense of a rail-road communication.

On the advance of winter, the greater part of this exploring force was necessarily withdrawn, and in fact terminated its labours; although some of the work may, from time to time, be advantageously extended.

The deep ravines of Sharp mountain, originating probably in transverse fissures across the entire stratification, are, in certain material circumstances, unfavourable to the developement of any coal veins as they pass across and beneath them. Doubtless, the thinning off and the disturbing effects impressed upon the intersected veins in these gaps, are traceable to the same cause. Coal seams which, in the immediate borders of the ravines, have been subjected to these deteriorating influences, will, no doubt, be found in superior condition when more remote from them: at least our local experience has determined this to be the case wherever veins have been traced to a distance from the gaps. We have still to identify at Rattling Run the coal veins of which we have spoken as occurring seven miles more to the west. We have still to prove

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the precise locality here, of those veins we have worked at the Big Flats; notwithstanding that in both cases we possess sufficient data to point to their "whereabouts." These will at some future period be satisfactorily proved; and the time may be not very remote when the Big Flats coal shall be worked by drifts from Rattling Run to an extent of three or four miles to the westward, and as far also to the eastward.

All subsequent examinations, hereabouts, will be of comparative easy and economical execution. Our knowledge is now concentrated. We have established, in numerous cases, facts, both negative and affirmative. Henceforward, we shall not grope in almost utter darkness, as heretofore.

Thus far we think we have succeeded in demonstrating that this gap may with safety be fixed upon as a coal station.

The breadth of the coal region, soon after passing the Big Flats, is about a mile. At the gap, the distance between the lowest or the 2½ feet coal vein on the south slope of Sharp mountain, and the red shale on the north side of the Fourth mountain, is above 5,000 feet.

Computations of the quantity of coal obtainable here, as is evident from the foregoing details, must be influenced by numerous contingencies, and should be offered and received with that understanding.

Where the data are thus unavoidably uncertain, we would desire to be cautious in putting forth any calculations, of which subsequent operations might expose the fallacy. On the other hand, it is due to the proprietors to exhibit what was actually determined by our recent investigations; to which may be added those other data which amount almost to certainty, or

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are fair matters of inference, to be reasonably admitted into preliminary estimates. Premising thus much, we shall attempt to form a calculation of what may be expected from a colliery established at Rattling Run Gap.

Amount of Coal from a five hundred feet central breast.

1. The Perseverance vein, estimating from the water level of 740 feet above the canal, taking the last admeasurement of 5½ feet, working out three miles of breast, and allowing half a mile of loss or depreciation in the gap.

2. One vein traceable from the Big Flats, say only two feet thick, and under the like circumstances.

3. The vein next north of the Perseverance vein, say only two feet, same.

4. One North mountain vein, also estimate on only 2½ feet, for three miles.

These four veins, at their minimum aggregate thickness of 12 feet, and an average breast of about 138 yards, will produce 2,915,000 tons.

We have omitted in the foregoing statement certain ordinary allowances for waste, pillars, contingencies, faults, &c.

Because the deduction of half a mile would of itself be probably adequate to all these.

Because we conceive, that in this bituminous coal, properly worked, there will be very little waste, the whole being equally saleable.

Because it is quite as probable that the veins will prove thicker, rather than thinner, than the dimensions we have adopted.

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Because, among the twenty-one veins, whose outcrops we have discovered, there may be some others besides the four that are admitted into the above computation, that may yet be advantageously worked when traced beyond the influence of the ravine.

And because nearly all the veins rejected from the present statement, are from 150 to 200 feet lower than the water level assumed as the basis of this calculation.

The transverse section at Rattling Run Gap, admits of the following stratagraphical classification; measuring, of course, perpendicularly to the several beds; commencing at the red shale of Sharp mountain and proceeding northwards to the red shale of the Fourth mountain.

TABLE II.

DESCRIPTION.	No. of Coal Veins.	Strata Ten Feet.	Total Thickness.	STRATA.	REMARKS AS TO GROUPES.
From the Red Shale to Shaft No. 5, including crops of	2	170	170	Chiefly soft Shale.	Corresponding with the series at the six mile openings. Coals very dry at the Gap.
No. 5 and 6 adjoining,		100	270	Hard rocks, chiefly conglomerate.	
No. 6 to 11, Reliance Vein, - - - - -	4	140	410	Chiefly soft beds.	
No. 11 to 15, - - -	2	130	540	Chiefly soft.	Corresponding with the Benches below Beartown.——Dry Coal.
No. 15 to 16, - - -	1	100	640	Hard conglomerate.	
No. 16 to 20, - - -	3	160	800	Argillaceous strata. - - - - -	
No. 20 to 27, to summit,		300	1100	Conglomerates & grits, with a few slate seams.	Corresponding with Beartown.
No. 27 past 31, on N. slope, - - - -	3	240	1340	Alternating hard and soft strata; chiefly the latter. - - - -	Corresponding with Fort Look-out and the Big Flats.
No. 31 to 35, N. slope,	1	450	1790	Soft strata, conglomerates and sandstones predominating.	Corresponding with the three Backbone Ridges east of this Gap.
No. 35 to foot of 4th mountain, - -	2	1000	2790	Alternating strata, including the best Coal veins.	Central Veins of the Valley Slope, and broken ground therein.
The 4th mountain to Red Shale, - -	3	2800	5590	Hard and soft beds, the former prevailing.	Not proved on the north slope of 4th mountain.
Coal Crops,	21	5590	Feet of the Coal Formation.		

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General course of the stratification and veins of the Third mountain, N. 64½° E. to N. 67° E.

General course of the stratification and veins of the Fourth mountain, N. 65° E.

Inclination of the coal seams in Third mountain, 74 degrees to the north on the west side; 79 degrees to the north on the east side of the gap.

Inclination of the coal seams in Fourth mountain, 46 degrees to south.

Nearly every one of these seams has a slate floor and a conglomerate roof. Vide Plate, No. 147, Fig. 2.

Quality of the Rattling Run Coal.

It is somewhat harder than that of the Big Flats: the proportion of fine coal, as brought out from the heading, is from one-third to one half; but when it can be regularly mined, the proportion will be greatly less; for at the termination of the drift, the proportion was about one ton of small, to four tons of large coal. There are about three hundred tons now on the bank, which were brought out of this heading. The position of the ground furnishes an excellent landing place at the mouth of the adit. Two analyses of this coal, from different parts of the Perseverance vein, shew the following results.

1st Analysis near the crop—Carbon,	78.80	
Volatile matter,	13.20	
Ashes,	8.00	
		100.00
2nd Analysis in the drift—Carbon,	76.10	
Volatile matter,	16.90	
Ashes,	7.00	
		100.00

A third analysis, by Professor Booth, gives 15.8 per cent proportion of volatile matter.

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YELLOW SPRINGS GAP.

Sixteen and a half miles by Stony Creek Rail-road from the Susquehanna—96 miles from Havre de Grace —132½ miles from Philadelphia by Stony Creek and Lancaster Rail-road—142½ miles from Philadelphia by Port Mifflin and Union and Schuylkill Canals—175½ miles from Philadelphia by Stony Creek and Union and Schuylkill Canals. Elevation of the principal coal drifts, 990 feet above the Pennsylvania Canal—1,317 feet above the tide water level—857 feet above Union Canal at Port Mifflin—603 feet above Stony Creek.

This gap is not so deep by 200 to 250 feet as Rattling Run Gap; but it is conceived that the amount of bituminous coal here, equals, and probably exceeds that obtainable at the last described position. The Yellow Springs tract is one of the company's recent purchases, and is the key to their coal strata on either side for several miles.

None of the veins which we traced at the last gap, on the southern slope of the Third or Sharp mountain, have as yet been proved or even sought after here. Those which we shall now proceed to notice are, with one exception, on the north side of that mountain.

Three drifts, in as many parallel veins, opened within the breadth of 150 feet, are now completed here, ready for the working of the coal. Two other veins are partially proved, as is another on the south slope of the Fourth mountain. The advance of winter suspended all operations here. We found some old works in this gap, commenced in the year 1826; and it appears to have been the opinion of those who had charge of the explorations in that day, that there were

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indications of twelve or thirteen coal seams, of which six exhibited coal of the aggregate thickness of 20 feet 10 inches.

As at Rattling Run, and indeed every where along its course, the north slope of the North or Fourth mountain has never been examined; and, therefore, its mineral strata are entirely unknown to us.

The examinations which had commenced on its southern slope, were stopped last autumn by the abundance of water rising in all the trial shafts. One vein we found here four feet thick at twenty feet down; lower down it was six feet thick, and the ground then becoming faulty, it greatly thinned off at forty feet depth. An adit may advantageously be opened here, as there appears to be no intervening hard rock,* and it offers the cheapest mode of draining and working this and other veins which are indicated here.

Drift No. 1, is in the "Backbone vein" of the Third mountain, a beautiful compact bituminous coal, of large conchoidal fracture, much resembling in external character the Peacock vein of Gold mine and Black Spring Gaps. At 32 feet down in the trial shaft, the vein consisted of three feet of good hard coal, (obtained by blasting,) and one foot of soft coal.

The dip of this vein is 85 degrees to the north, and approaching to vertical. Course of the vein, N. 65° E. —slate floor—puddingstone roof. Analysis of 100 parts of the coal from the trial shaft.

* Of this fact we must remain in doubt until the work is actually put in execution. At Rattling Run, the Perseverance tunnel was delayed for months, by the interposition of a thick bed of conglomerate, which did not shew itself on the surface.

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Carbon,	74.70
Volatile matter,	14.80
Ashes,	10.50

This must still be considered an analysis of the crop of the vein, rather than of the vein itself, which, when at sufficient depth, will no doubt exhibit more volatile matter and less ashes or earthy impurities. Its specific gravity is 1.389, and the weight of one cubic yard is one ton and one hundred and three pounds. A vein very cheaply mined.

Drift No. 2, *in the Kugler vein*, has been carried 276 feet in a vein of splendid pure blazing coal, now six feet three inches thick, and appearing to increase at every yard. Course, N. 65¾° E.; present dip, 68½° to the north; original dip at entrance, 44½° only. Floor, slate; roof, coarse conglomerate. Several hundred tons of coal now lie on the bank. This will be a very cheap vein to work. Analysis of this coal at different stages of advance along the drift.

	No. 1.	No. 2.	No. 3.
Carbon,	80.33	81.20	77.50
Volatile matter,	8.86	9.80	11.00
Ashes,	10.80	9.00	11.50

The specific gravity of this coal, at two different parts of the tunnel, gave

at 137 ft. in the tunn., sp. gr. 1.391=1 ton and 107 lbs. per cub. yd.
near the present termination, 1.395=1 ton and 111 lbs. do.

Drift No. 3, at present only 144 feet in a seam of good hard coal, much liked by the blacksmiths, and will probably prove to be a three or four feet vein. It is now four feet wide between roof and floor, including bony slate. Roof, puddingstone; floor, slate. Dip 37 degrees to the north; which inclination will no doubt increase many degrees as the seam is proved under greater cover.

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Specific gravity, 1.361, equal to one ton and fifty-six pounds per cubic yard.

The fourth vein, only 60 feet north of the last, appears to be small at present, but has not yet been drifted into.

The fifth vein is 255 feet south of No. 1, occurring on the south slope of the backbone ridge. It is not yet sufficiently proved: the coal is good and is deserving of further examination.

All the above mentioned veins are affected both in their inclinations and courses in the immediate vicinity of the gap, but improve in quality and size as they recede from the gap and acquire more cover.

The main Rausch Gap seams, the Grey and the Heister veins, which we do not think are yet discovered here, we confidently think will be traced as far as this gap; as will no doubt two or three of the North mountain veins from thence.

The situation of Yellow Springs Gap for a colliery, is little, if any, less advantageous than that of Rattling Run Gap, and is greatly superior to it as regards amount of coal.

An immense quantity of coal, of several varieties, and of different degrees of compactness, can be worked out at a very cheap rate, from both sides of the gap. All that is wanted, ere putting these drifts into immediate operation, is the means of transporting it down the valley.

No work of importance was done here until June last, nor since December; and all the foregoing data have been acquired by the labour of a force never exceeding six or eight hands. The work in the drifts is performed in a substantial manner, and the water levels in each have been carefully maintained.

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There is good reason to think that one or two other seams, of greater size, exist in the flat, a few yards to the north of those which have been already explored, but for which there has been no time for examination.

We made repeated endeavours by running compass lines and by other methods, to trace the thick veins of Rausch Gap, five miles westward to this spot; as also those of Yellow Springs from hence three miles to Rattling Run Gap, without satisfactory or decisive results. There are many circumstances, such as changes of course, of inclination, of elevation, and the obscurity of a surface covered with vegetation and loose rocks, that are adverse to the successful tracing of coal veins in this region. We rely greatly for the means of identifying these beds on a comparison of the respective diagrams, maps, and cross sections. Where these are insufficient, or incomplete, there can be no other way so safe as to trace along the outcrops by means of an extensive series of trial pits, a work of no small labour and expense.*

Trial Openings opposite to the Cold or Virtuous Spring,

On the north slope of Third mountain, eighteen miles above the Pennsylvania canal, and midway between Yellow Springs and Rausch Gap. This position is near the eastern termination of the company's estate. It was desirable to prove the continuance and especially the quality of the coal seams thus far; for like those at Yellow Springs, they had been hitherto considered as anthracite.

The gap at Yellow Springs presents the proper out-

* For the section of Yellow Springs Gap, vide Pl. No. 147, Fig. 3.

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let for the coal of this quarter, until a tunnel from the south side of Third mountain be carried up, at a low level, so as to penetrate the whole series of coal seams. Enough, however, exists even above the water level at Yellow Springs, to furnish occupation and profit to the present generation; and by continuing the water level from Rattling Run Gap, there will be an accession of more than two million tons per mile for about four miles, without having recourse to tunnelling or steam power.

The trial pits were sunk here late in 1839, and the season was too far advanced to extend them as was wished. Four shafts shewed coal crops. At the depth of 32 feet, a vein of good hard coal, five feet ten inches thick, and enlarging downwards, was proved. In burning, it shewed the presence of bitumen, throwing out a white flame, although of less brilliancy than the coal of the flats. The colour of the ashes of most of these veins is of a dull salmon colour.

One hundred parts of the six feet vein gave as follows:—(H. L.)

Carbon,	76.30	Specific gravity, 1.403, being
Volatile matter,	11.10	equivalent to one ton and 127
Ashes,	12.60	lbs. per cubic yard.

It must be borne in mind, that this analysis is solely from the outcrop coal.

Two larger seams, (the Grey vein and the Heister vein,) will probably be found not far to the north of this vein, prolonged from the Rausch Gap.

At this position it was seen that all the coal veins change their dip, and are now about 80 to 85 degrees to the south. They occur chiefly in argillaceous shale beds.

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Amount of Coal above the water level of Yellow Springs Gap.

From what has been already proved here, and from the tracing of some others near to this position, we can confidently calculate on seven veins, having an aggregate of 21 feet of coal, within the interval of the eastern extremity of the company's land, and midway between the Springs and Rattling Run.

These with a breast of one hundred yards, will produce	4,620,000	tons.
We are unable to speak of any veins to the south of Sharp mountain ridge, as the ground has received but little examination. Should such be the case, they will be accessible at a much lower level than we adopted in the above estimate.		
If the water level from Rattling Run be extended thus far (to the company's line), the depth being at least 200 feet greater, will occasion an extra yield of coal of	3,080,000	„
Making an aggregate of . .	7,700,000	„
To this if we add the first computation of coal from Rattling Run, being 2,915,000 tons; but in order to keep the calculation within limits, say	2,500,000	„
The gross quantity obtainable above the present water levels between the Big Flats and the company's boundary, opposite Cold Spring, a distance of nine miles, will be . . .	10,200,000	„

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There exists another mode whereby the deep working and draining of this part of the region will ultimately be facilitated. It has been ascertained that the water levels of the Rausch Gap veins, and that of the Perseverance vein at Rattling Run, are similar. If the drifts for working the best coal veins at either gap, were prolonged, they might, with the necessary allowance for drainage, have their exit at either or both extremities. They would pass under Yellow Springs Gap, at 250 feet below the present water level of the main veins there. The coal works projected by the proprietors of the Rausch Gap mines, could not fail, as they advanced westward to their boundary, to facilitate the deep operations of the Dauphin company, from their side. It would be a matter for the consideration of these parties, in after times, to make arrangements conducive to the mutual interests and convenience of both estates. At all events, the larger amount of ten millions of tons, will be rendered available: the statement may be accepted with little hesitation, in connection with the chance, the certainty, we might even say, of an increase, proceeding from the number and enlargement of the deep veins.

Amount of Coal below the present accessible Levels.

It may be well to preface this enquiry with a brief sketch of certain characters in the contour of this coal field.

A series of cross sections shew that for several miles the strata on either side of Short mountain, dip towards each other at corresponding angles, gradually flattening across the centre of the basin. On advancing eastward, the ridges forming the edges of this

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basin recede. Enormous tilted masses of the coal formation incline towards each other, at angles of 45 to 60 degrees from the north, and 70 to 80 degrees from the south. New groups of strata are by degrees interposed, and more veins of coal make their appearance. At length the southern group becomes wholly perpendicular, still exhibiting the continued increase of coal seams, and the wedging in of new materials. Gradually this vertical arrangement changes. The inclination is reversed; and in the language of the miner, the "top rock becomes the bottom rock." The whole series of Sharp mountain veins is heaved over; and for several miles inclines at an angle of 80 to 85 degrees to the south.

We advert to these phenomena, that they may, with the aid of the diagrams, exemplify the arrangement of the coal seams; such as their wedging out to the west, and the upheaving of the whole basin in that direction, and their consequent accessibility at certain points and not at others, and also to exemplify those variations in the courses and positions of coal veins which increase the difficulty of tracing them in this district. For instance: a tunnel driven in the red shale near the six mile openings, at 740 feet above the canal, would probably pass under the coal formation altogether. At Rattling Gap the coal field is entered at an elevation of only 500 feet above the level of the State canal; and an adit level instead of passing along or beneath flat strata, would intersect them where they are only 10 or 15 degrees from the vertical. We need scarcely add, that an adit which is driven, as in these cases, towards strata which incline *from* it, would be shorter in proportion as the strata increased

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in perpendicularity; and would be yet further shortened when, by the further change in the inclination of those beds, they were directed *towards* it. These accidental circumstances of position in the strata become items of no small importance in works of this nature.

At Yellow Springs, a tunnel 2,000 feet long, would extend to and include all the principal veins, if commenced at 740 feet elevation, the level of the Perseverance vein; and would then be 250 feet under the present Yellow Springs coal drifts.

At Rattling Gap, an adit of 2,000 feet, if began at 500 feet elevation, would also pass to the principal coal seams, and intersect eighteen veins, at 240 feet beneath the water level of the Perseverance vein, presenting a breast of full 900 feet of coal.*

If commenced on the same level of 500 feet at Yellow Springs, the requisite length of tunnel would be 3,500 feet; but it would strike the central coal at 490 feet beneath the present openings there.

If at Rausch Gap, a tunnel to reach the central veins, from a 500 feet level above the State canal, would be 4,000 feet in length, and 230 feet below the surface of the ravine at the mines.

The increased lengths in the two last instances, are occasioned by the increased elevation of the valley of Stony Creek. We have found it necessary to allude the more frequently to Rausch Gap, because there is a very large developement of coal veins there; all which

* Let it be noted here, that there is no interposing series between the red shale and the coal measures; no intervening formation deserving the appellation. As regards this region, the whole group constituting the coal formation, is made up of an immense series of alternations of argillaceous and siliceous strata.

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we have reason to believe pass into the company's property opposite Cold Spring.

As regards, therefore, the means of working out the coal from the present water levels, and by a system of tunnels or adits, the obtaining the coal from the deeper part of the basin, Rattling Run Gap appears to offer the greatest facility, at the cheapest rate. We recapitulate the previous data, assuming a common base of 500 feet above the canal.

1. Rattling Run Adit, 2,000 ft. long*
2. Yellow Springs, 3,500
3. Rausch Gap, 4,000

} to produce the same result.

The amount of coal upon the company's estate obtainable by these or any other tunnels having the same base of 500 feet, without making any estimate for the additional number and thickness of the veins that might come in at a lower level, will be 5,000,000 tons.
Coal, as per first statement, from the
740 feet level, ... 10,200,000 „

Aggregate to this depth of the basin, 15,200,000 „

QUALITY AND ADAPTATION OF THE SHORT MOUNTAIN COAL.

The earliest notice of the economic uses and value of this coal, we find in the interesting series of experiments made by Mr. Marcus Bull, previous to 1827, to determine the comparative value of the principal varieties of fuel used in the United States and in Europe. It is therein shown that the coal of Stony Creek (or Short mountain) maintained a longer duration of

* It would not be difficult to obtain a 50 feet lower level, by extending this adit about 500 feet lower in the red shale towards Stony Creek, or 450 feet above the canal.

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heat than any other bituminous coals, (except cannel coal.) As regards comparative value, ascertained from the weight, it was superior to them all.*

In the Appendix to the Report of the Select Committee, to whom Congress referred the subject of a NATIONAL FOUNDERY, is a communication, signed Walter R. Johnson, wherein we find the following observation. The writer, speaking of the adaptation of various coals for the manufacture of iron, remarks: "I can say, with some of the chemists who have analyzed the Maryland coal, that 'I do not know of

* TABLE III.

The Tables shewing the results of Mr. Bull's useful experiments, have been transferred to the pages of several works which treat on these subjects. As regards those on coal, in particular, there scarcely needs an apology for introducing them, with some modifications, in this note, in order to afford the means of easy reference.

DESCRIPTION OF COALS.	LOCALITY.	Specific gravity of dry Coal.	Pounds of dry Coal in one bushel.	Time 1° of heat were maintained in the room by the combustion of one pound of each article.	Value of specified quantities of each article, compared with Shellbark Hickory as the standard. = 100
	BITUMINOUS COAL.			H. M.	100 bushels
Foreign Bituminous Coal.	Cannel,	1.240	65.25	10 30	230 "
	Liverpool,	1.331	70.04	9 10	215 "
	Newcastle,	1.204	63.35	9 20	198 "
	Scotch,	1.140	59.99	9 30	191 "
Amer. Bituminous Coal.	Karthaus, or Alleghany,	1.263	66.46	9 20	208 "
	Richmond, or Virginia,	1.246	65.56	9 20	205 "
	Stony Creek,	1.396	73.46	9 50	243 "
	ANTHRACITE.				
Schuylkill Coal Region.	Lehigh,	1.494	78.61	13 10	99 tons.
	Swatara,	1.459	76.77	11 20	85 "
	Schuylkill,	1.453	76.46	13 40	103 "
Wyoming Region.	Lackawaxen,	1.400	73.67	13 10	99 "
	Susquehanna (Wyoming)	1.373	72.25	13 10	99 "
New England.	Rhode Island,	1.438	75.67	9 30	71 "
	Worcester,	2.104	110.71	7 50	59 "

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any coal in this or any other country superior to this variety,' except, perhaps, the Stony Creek coal of Pennsylvania, which my experiments proved to contain only 12½ per cent. of volatile matter, and which thence appears to have undergone, much more completely than the Maryland coal, the process supposed by some to have deprived the latter of a part of its bitumen, and nearly converted it into coke."

The means of transporting this coal from any of the gaps down to the Pennsylvania canal not being yet effected, we cannot refer for examples of its practical uses and properties to works where it has been employed on a sufficiently extensive scale. Two or three hundred tons were brought down the mountain from the Big Flats, just previous to the winter. This is the softest quality of coal and the thinnest vein worked by the company. Some of this coal has been successfully used in the rolling mills and iron works in the neighbourhood of Harrisburg; and smaller quantities were tried in Philadelphia, in the manufactories of Mr. William Norris, and Messrs. Merrick & Towne, and in the brewery of Messrs. Dawson & Co. It was also satisfactorily tried in generating steam in one of the locomotive engines on the Lancaster rail-road. The blacksmiths around the neighbourhood of the mines, have purchased this coal in preference to any other, even at lower prices, whenever they could get it.

Experiments have been made to ascertain its heating powers, in the laboratory of the University of Pennsylvania, the Columbia College at New York, and the Navy-yard at Brooklyn.

In Boston, the Stony Creek coal has been tested by chain-makers, anchor-smiths, and other mechanics,

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who speak of it with approbation, as well adapted to their uses.

An advantage, connected with the Stony Creek mines, must not be overlooked. We refer to the singular variety in the quality and adaptation of different veins, and even of the coal of the same veins, at different mining stations, as we advance eastward. There is here, therefore, to be obtained, every shade of gradation, as to amount of carbon or volatile matter; compactness, density, different modes of burning, and of applicability to specific purposes; from the soft bituminous coal of the blacksmiths, to the harder transition variety, such as exists at Rausch Gap; and to the free burning anthracite, approaching to coke, of the Mount Eagle mines. Certainly there exists no known parallel to this state of circumstances on the continent of America.

This gradual transition is not even recognised so completely in the great coal field of South Wales. In an economic sense, therefore, the advantage is in favour of the Stony Creek varieties of coal.

In a printed circular, by Professor Renwick, dated Columbia College, New York, 1832, the writer observes: "the bituminous coal (of Stony Creek) is yet known principally by its analysis. Should this coal be found to be as abundant as there is every reason to believe, the portion of the lands that contain it, cannot fail to acquire a value beyond all calculation; for it will afford facilities for the manufacture of iron equal to those proposed in the most favourable positions in Great Britain; and would enable that important article to compete with the European, without the aid of any protective duty."

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IRON ORES.

1. *Argillaceous Carbonate of Iron.* The investigations heretofore made upon this estate, have, as in the main Schuylkill region, been chiefly directed to coal rather than iron. It was formerly thought that no iron ores, adequate to the supply of a blast furnace, existed within the entire area of this southern or Schuylkill coal field.

Yet within a very short period has the immensely important fact been thoroughly established, that seams of argillaceous iron ore prevail abundantly, and are now discovered from day to day. These beds are not strongly indicated upon the surface; but have been chiefly brought to light during the operations of tunnelling and cross heading, from one working to another. That certain of these ferruginous strata pass along our southern fork and enter Lebanon and Dauphin counties, we already possess evidence. Those that so occur, are of remarkable purity, as their assays indicate.

It has always been the opinion of the most intelligent persons, conversant with the peculiar properties of the Stony Creek bituminous coal, that it is especially calculated to act as an ingredient in the process of making iron; and that Stony Creek Valley offered unusual advantages in consequence, for the manufacture of that useful staple. This opinion was even formed when it was thought that all the ore must be brought hither from a distance of 45 or 50 miles. The probability was scarcely contemplated that the locality itself would furnish the ore, as well as the fuel, whether wood or coal.

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We are not now prepared to report on the capabilities of this property to accomplish this. As has been stated, our search was for coal; and it is only accidentally that ores of iron were observed.

At Black Spring Gap, on both the Third and Fourth mountains, and at Rausch Gap, the argillaceous carbonate of iron is interstratified with the coal measures, and accompanies several of the veins.

At Rattling Run Gap we have met with balls both of fine and coarse ore. The specific gravity of the former is 2.19. Kidney ore accompanied the coal shale at the six mile openings; but its amount was never sought to be ascertained.

2. *Hæmatite Iron Ore* occurs almost every where, scattered upon the surface of the coal formation—sometimes abundantly; but we have met with no important deposite at any one position yet; nor is it usual to find extensive beds of this description of ore within the coal region.

3. *Bog Ores.* At all the gaps and depressions in Short and Third mountains, and at most of the springs which break forth from their southern slopes, are accumulations, of greater or less magnitude, of bog ores. Their occurrence under these circumstances, appears to be attributable to the local structure of the district, and explainable thus.

It is known, that along the whole range of our Fourth mountain, the strata dip to the south, and that during this range of some thirty miles, there is no gap or notch to admit the drainage to descend northwards. On the other hand, the Third mountain is cut through to the depth of 500 to 800 feet at every three miles, on an average, by transverse fissures enlarged to ex-

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tensive ravines. The waters charged with ferruginous matter follow the descent of the inclined strata of Fourth mountain, down to the centre of the trough; and having no other means of exit, again rise among the broken edges of the tilted masses to the points where they can escape to Stony Creek Valley, by means of these longitudinal and transverse ravines, depositing, at numerous places and elevations, beds of bog ore.

Among the most conspicuous of these deposites is that of Yellow Springs, which attracted attention at least fifty years ago. This ore holds an intermediate relation between the hæmatites and the soft bog ores, exhibiting much greater compactness and crystallization than commonly do the latter.

Result of analysis of the bog ore of Yellow Springs.

Oxide of Iron,	76.7
Silica,	3.4
Alumina,	3.8
Water,	18.0
Total,	101.9

76.7 of iron = 53.1828 of metallic iron.

Between Rattling Run and Fort Look-out are three or four similar accumulations; also at several points along the Short mountain: from some of the latter, ore has been raised and converted into iron in the adjoining valley.

From the known circumstances attending these and similar deposites, they are scarcely to be relied upon for furnishing extensive permanent supplies of ore to iron works, but may be usefully employed with other ores in the furnace.

4. *Red Siliceous Iron Ore*, occurs stratified at the

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six mile openings, near the junction of the red shale and the coal formation, and about 50 feet below the lowest proved coal vein. It is a stratum, from two to three or four feet thick, passing below into a red conglomerate, and above into a red shale. We proceeded no further than to open the bed or quarry, and to raise several tons of the ore. Indications of this ore have been traced about a mile. It appears likely to yield a sufficient supply for an iron work.

Analysis of this ore—

Peroxide of Iron,	47.1
Alumina,	3.1
Silica,	doubtful
Metallic Iron, 32.65	Specific gravity, 2.67

At about a mile above Port Lyon, at the mouth of Clarke's Creek, is the Emeline furnace. Five miles up Clarke's Valley, and adjoining the Stony Creek estate, is Victoria furnace. A mile further up, and one-third of a mile from this property, is Victoria forge.

Both of these furnaces employ the hot air blast and charcoal. The ore used is partly the Chestnut-hill hæmatite, brought 45 miles from below, five miles from Columbia, and partly the red oxide of iron, brought from Bloomsburg, a distance of 77 miles.

Fire Clay can be obtained from the vicinity of most of the coal veins, from one end of the estate to the other.

Plastic Clay is obtainable in numerous positions, from the bed of Stony Creek up to the highest coal series.

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Adaptation of Stony Creek Valley as a site for a National Foundery.

Among the various positions named for the site of a *National Foundery*, that of Stony Creek has recommendations superior to most, perhaps to all others, that have been mentioned for this purpose. We may recount among the facilities offered by this location

I. That of uninterrupted canal transportation for boats carrying from 60 to 80 tons, to tide water at Havre de Grace; the distance of 80 miles being sufficient to secure this position from any sudden hostile approach of an invading enemy.

II. That of continuous canal and rail-road transportation up the Susquehanna and its tributaries and intersecting lines of communication to the north, and the east, and the west; from the Ohio to the Hudson; from the Chesapeake and Delaware to the Lake frontier.

III. That of ready access to the seat of government.

IV. Its immediate location in the midst of that description of coal which is declared to be the best adapted to the objects required; which coal is divisible into the following modifications, viz:

1. The soft blazing coal of Short mountain, capable of being coked.

2. The bituminous and somewhat harder coal of Rattling Run.

3. The four varieties of still more compact bituminous coal of Yellow Springs.

4. The intermediate or transition coal, consisting of eight or more veins at Rausch Gap, all in some respects varying from each other.

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5. The free burning anthracite, approaching to coke, or more highly carbonized coal of Gold-mine Gap, Mount Eagle, and Black Spring Gap; fourteen veins, all having perceptible differences in quality and structure.

V. Its facilities for obtaining several varieties of iron ore, as follows:

1. The brown, red, and black hæmatites, from near Columbia, by Pennsylvania canal, 40 miles to the south.

2. The calcareous red oxide of iron from Danville, 60 miles, and from Bloomsburg, 71 miles to the north, by Pennsylvania canal; also

3. The argillaceous carbonate of iron in seams, accompanying the coal veins here.

4. The excellent bog ore, hydrate of iron, also in the coal region of Stony Creek.

5. The red siliceous iron ore of Short mountain.

VI. The water power of Stony Creek, for which sites present themselves at nearly every half mile for 15 to 20 miles.

VII. The abundance of timber for lumber and for charcoal, extending along nearly the entire length of Stony Creek Valley, and the consequent cheapness of fuel. If for certain purposes, charcoal iron be considered indispensable, the wood of 60,000 acres is attainable.

All other considerations are comparatively unimportant after those enumerated under the seven preceding heads. To these, however, we are enabled to add other desiderata, to which, in the selection of a site for a public work of this kind, some degree of consequence has elsewhere been attached. These are

VIII. A favourable site for the proving of cannon:

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and here the slopes of Short and Second mountain present innumerable positions.

IX. Fire clay for bricks, linings, crucibles, &c., required in such a work, abounds in the argillaceous strata of this region. Limestone for flux, eight miles below Stony Creek. Plastic clay, for common bricks, occurs along the valley.

X. Facility of procuring provisions and other necessaries of life; being on the main avenue along which passes the grain, flour, corn, pork, and other agricultural productions of an immense region bordering on the Susquehanna and its tributaries, and even extending far westward beyond the Alleghany mountains. Little need be said about sufficiency of labouring population; because it is a fluctuating body, moving always in the direction of demand and remuneration, and will probably always be equal here to the required amount.

XI. The town of Port Lyon or Dauphin, and the valley of Stony Creek, afford appropriate and healthy sites for the residence of a working population, to almost any imaginable extent.

XII. Low prices of coal and iron ore are necessarily consequent to the state of things noted in IV. and V. There are several furnaces, forges and rolling mills already established in the vicinity of Stony Creek; from these additional supplies of excellent pig iron can be obtained.

In one or more of the sites most strongly recommended for a national foundery, it is stated that the coal will have to be brought from the mountains by rail-roads and canal, 200 miles, and the iron ore and pig iron 70, and 120 miles. *Here* both these ingre-

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dients, possessing every gradation of quality, exist upon the spot.

Improvements upon the Coal Company's Lands.

Within the last two years, the Company have erected four frame houses, sixteen log houses, two frame stables, two log stables, and four carpenter's and blacksmith's shops, at various points on their estate. They have also built one frame store-house, wagon-house, and five stall stable in Port Lyon or Dauphin.* A first rate sawmill, 105 feet in length, with extra power for a machine shop, foundery or small furnace: a dam or reservoir of fourteen acres on Stony Creek, and a large enclosed wharf and weigh-scale by the canal side.

Three miles of township road and eight miles of company's road have been repaired and almost reconstructed. Eight miles of wagon roads have been entirely newly located and made; chiefly on and along the Short mountain, on extremely difficult, rocky ground. Six more miles of horse road, wide enough for a sled, have been formed on similar rough ground; and four miles of footpaths cleared; besides ten miles more of paths merely marked out. A rail-road and inclined plane of thirteen miles, have been located from Rattling Run mines to Dauphin dam. Surveys for extending the same, have been carried to the summit level between Stony Creek and Evening Creek, altogether 24 miles. From that summit another survey has been carried eastward to the Union canal feeder

* These are exclusive of the older buildings on the estate, now comprising five farm houses, with their attached buildings; besides the establishment at the Cold or Virtuous Spring, bathing houses, &c.

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near eight miles further. Lateral surveys connecting with the main line have been made up all the intervening ravines or gaps of the Third or Sharp mountain, entering into the coal region. The Engineer's maps, sections, report, and estimates of this rail-road, are in the Company's office.

Specimens of every one of the veins of coal, and varieties of iron ore, referred to in this report, accompanied by the analysis of many of them, are deposited in the office of the Company at Philadelphia, and duplicates in the country office.

Illustrations. A numerous suite of diagrams, surveys, both geological and topographical, levels, maps, sections, and details, of every explored position, are also in the Philadelphia office, and duplicates in the Dauphin county office. These documents have been very carefully constructed, and form by no means the least part of the labour of the last three years. Up to the present time, they amount to one hundred and fifty; of which number at least fifty have been constructed during the past year.

Prospects of an Extension of the Coal trade of Pennsylvania.

It is beyond all doubt that the consumption of Pennsylvania coal and anthracite is steadily increasing. The annual returns since the commencement of that trade in 1820, fully attest that fact. But there are circumstances wholly independent of the enlarged demand for these combustibles in the Atlantic states for ordinary domestic purposes, that assure us that the requirements will proceed at a greatly accelerated

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ratio; and most rapidly of all within the limits of our own state.

It appears further, that in a similar ratio as the consumption of this admirable fuel, the Pennsylvania anthracite, increases, so does the importation of foreign or English coals diminish; and the remark even extends itself to the diminution of Richmond bituminous coal, during a given term of years; while the importation of bituminous coal from the British provinces is rather more than the average of the last four years.

This is exemplified in the case of the importations into the port of *Boston*, during the last five years, as set forth in the following table.

TABLE IV.

Years.	American Coals.		Foreign Coals.		Aggregate of Bituminous Coals.	Anthracite shipped from the mines of Pennsylvania during these years.
	Pennsylvania Anthracite.	Richmond Bituminous Coals.	Nova Scotia.	English.		
	Tons of 26 to 27 bushels.	Chaldrons of 36 bushels.	Chaldrons.	Chaldrons.	Chaldrons.	Tons.
1835	76.180	4.504	11.767	3.737	20.008	556.935
1836	67.186	5.958	20.302	7.114	33.374	696.526
1837	74.189	2.241	35.257	12.762	50.260	874.539
1838	69.850	2.972	19.863	9.300	29.163	723.836
1839	84.123	1.778	30.725	3.485	35.988	785.553
Estimated consumption of the year 1840, - - - - - - - - - -						857.000

Hence the anthracite trade of Pennsylvania is decidedly on the increase; while the bituminous coals borne coastwise, or imported, have either remained stationary or have furnished a diminished supply. The bituminous coal of this state awaits the means of transportation to assume an important position in the market. That of Stony Creek, so near to tide, cannot fail to occupy a singularly advantageous position.

But there is a prospect of additional demand for Pennsylvania coals in a much more rapid ratio than

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the past, by the vastly increased employment of these combustibles in the manufacture of iron, where heretofore wood charcoal has only been used. It is impossible to speculate now on the advantages which these improvements will bring about, as relates to the employment of exhaustless millions of tons of anthracite, and the varieties of bituminous coal; but we feel assured of its vast importance to Pennsylvania. This subject has been well defined in the Report of the Board of Trade to the Coal Mining Institution of Schuylkill county, in the present year.

COST OF MINING AND TRANSPORTATION OF BITUMINOUS COAL.

It has been customary to sell the soft fine coal, brought down by arks from the Susquehanna and Juniata rivers, by the bushel measure. The coal of Stony Creek being more compact, and brought from the mines in larger masses, admits of the selling by weight, rather than by an undefinable and objectionable system of admeasurement by quantity, and this practice of calculating by the ton, will therefore prevail here. The prices of Susquehanna coal are very uncertain; there being no regular collieries connected with the trade, and the supply is matter of mere chance, influenced by the facilities of floating down arks in certain seasons, during freshets. Consequently, there is sometimes a scarcity and sometimes a superabundance on sale at the towns and landing places on the banks of the Susquehanna.

Thus, in the winter of 1838, it was retailed as high as 45 cents per bushel at Columbia, and 50 cents at

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Lancaster. At the present moment, it is offered at 11 cents per bushel at Columbia, and 10 cents at Harrisburg, and it is expected to be as low as eight cents, and perhaps lower.

In 1838, the business of more than one rolling-mill and reverberatory furnace in the vicinity of Harrisburg was entirely suspended, from the want of bituminous coal; and the Dauphin and Susquehanna Coal Company could have sold any amount at 25 cents per bushel, on their wharf.

In 1839, such a quantity descended the river, that the market was entirely overstocked, and there was difficulty in finding purchasers at 16 cents per bushel; it being commonly considered that 20 cents per bushel at Harrisburg or Middletown, is a fair remunerating price. This excessive supply has brought it down to 10 cents only. Such a state of things will no doubt occasion a reaction another season. Those who have found it so unprofitable and losing a business, will probably forbear sending even an average supply: the coal dealers in Harrisburg and elsewhere, who lost money when they bought at unusually low prices, will be cautious in increasing their stocks, and the prices may again rise to an unnecessary height.

This uncertainty in the bituminous coal trade, must continue so long as the facilities for furnishing the supplies are so irregular, and are governed by such precarious circumstances. The opening of the Tide Water canal to the Chesapeake, will tend to counteract this in some degree, and to establish a more regular trade than heretofore, from a nearer source.

From Havre de Grace the Stony Creek coal can be conveyed by sloop or boat navigation to Baltimore,

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Philadelphia, New York, and other ports. From the landings at Port Lyon or Dauphin the distance to Philadelphia, via Havre and the Delaware and Chesapeake canal, is 159 miles. By the route of the Union canal and the Schuylkill navigation to the Schuylkill side of Philadelphia, the distance is also 159 miles; there being altogether 130 locks to be passed with a total rise and fall of 701 feet. The Union canal being at present adapted for boats of twenty-five tons burden, conveys but a few thousand tons of bituminous coal annually to Philadelphia. When enlarged to the capacity of the State canal for boats of from 60 to 80 tons, a great increase of business will no doubt ensue; and by this channel the coals from the sources of Stony Creek and Evening Creek will find its way to that market, with those of the Pinegrove region.

For the present, therefore, we shall limit our estimate of the cost of transporting the Stony Creek coal to tide, and thence to Philadelphia and Baltimore, because this route has the advantage of 327 feet only of lockage, in 40 locks; while on the other route, the lockage is 738 feet, in the same distance to Philadelphia.

As the cost of mining coal is influenced by local and contingent circumstances, attending the veins themselves, their thickness, regularity, nature of roof and floor and undermining; their position, whether above or below water level; the amount of timbering required, and the local value of such timber; the distance to bring it to the surface; also the price of provisions, the abundance or scarcity of labour at given periods, and even the market value of the particular coal in

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question, there can be no fixed standard of comparison in these cases.

At Wilkesbarre, anthracite has been delivered at the landings at $1.25 per ton, and $1.50 in the town. At Pinegrove, we were informed by the proprietors, the Panther head veins cost 75 cents per ton to work them; the coal costing $1.50 at the basin at Pinegrove, conveyed about five miles on a rail-road. The Lorberry Creek colliery higher up, costs, it is stated, $1.75 per ton at the Pinegrove landing. These prices are, no doubt, slightly modified every year.

The same doubtless around Pottsville, or any other coal district, and similar circumstances prevail. The average valuation on the landings there, is stated on good authority, to be $2.25 per ton. According to the recent Report of the Board of Trade to the Coal Mining Association of Schuylkill County, "the cost and wastage on the landings, the toll and transportation on the canal, the charges and wastage on the wharves in Philadelphia, including all expenses until the coal is in the vessel at Philadelphia, amount to from $3 to $3.25 per ton." This is exclusive of the value of the coal at the landings.

In the Report of the Committee of the Senate on the subject of the coal trade in 1834, the cost of mining and transporting bituminous coal from Karthaus and the Clearfield mines to Philadelphia, was estimated at $5 per ton, by arks down the Susquehanna. A previous calculation of the cost of the same coal, by way of the Sunbury and Pottsville rail-road and the Schuylkill canal, also fixes $5 as the expense at Philadelphia. The cost of delivering the Philipsburg coal was estimated at $4.97.

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The George's Creek Company, in 1836, calculated the cost of their bituminous coal delivered at Georgetown at tide water, about 200 miles from the mines, at $4.39 per ton, exclusive of profit. Prior to this, in the Report of the Internal Improvement Convention assembled at Baltimore, the estimated cost of delivering the Frostburg bituminous coal at Philadelphia, is set down at five dollars per ton, or 17½ cents per bushel.

The Virginia coal (Blackheath) sells by the cargo, delivered on the landings at Richmond for $5.94, and the freight to Philadelphia is about $2.10 per ton.

In a calculation, made several years ago, it was estimated that the cost of the anthracite from the Stony Creek estate, delivered in Philadelphia, would be $4.27 per ton; and that of the bituminous coal would be $4.74 per ton. At the present time, and with increased facilities, it is believed that the cost will be less, as will appear from the following data.

Propositions have been made to contract for mining the anthracite Grey vein of Black Spring and Goldmine Gaps, at 40 cents per ton. One or more of the Rausch Gap veins could now be contracted for at 37½ cents per ton, exclusive of hauling, and probably none will exceed 50 cents per ton, for mining there. Other parties have offered to deliver the company's bituminous coal on the bank, at Yellow Springs, including laying the rail-road and heading the gangways in the mine, for 50 cents per ton. The Perseverance vein at Rattling Run can be mined on contract and delivered for 75 cents, including laying rails and heading the gangways, timbering, &c.

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Cost of Stony Creek Coal in Philadelphia.

We proceed to estimate the cost of delivering coal from hence in Philadelphia. The calculation is applicable either to Rattling Run, 13 miles, or to Yellow Springs, 16 miles, above Port Lyon; inasmuch as the cheaper mining at the more distant point will more than compensate for the increased transportation.

Mining per ton, ...	$0 50
Hauling, heading, deadwork, and making gangways, &c. about the mines, ...	0 25
Waste on the wharves, contingencies, and charges not enumerated, ...	0 11

This description of coal is not liable to deterioration from handling as in anthracite, because the fine coal is equally saleable with the large, and no screening is required.

Freight and toll per Stony Creek rail-road, 13¼ miles, per estimate of Mr. Miller, $1\frac{84}{100}$ cents per ton per mile = 24 cents; but say for a smaller amount of trade at the commencement than that calculated, ...	0 34
Cost of the coal in the boats at Port Lyon per ton, 13 miles, ...	$1 20

The toll on coal on the Pennsylvania canal is ½ a cent on the ton of 2,000 lbs.,* or $\frac{1.5}{100}$ of

* A suggestion may be hazarded, in this place, on the mode in which the toll on coal and anthracite is proposed to be collected on the State and Tide Water canals. In the table of rates of toll on the Philadelphia and Columbia rail-road, issued by the Canal Commissioners, and to be in force from and after the 20th of April, 1840, mineral coal is chargeable at the rate of three mills per mile per 1,000 lbs. weight, and on the Pennsylvania canal at the rate of 2½

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Cost at Port Lyon brought forward, .	$1 20
a cent on the ton of 2,240 lbs. The regular cost of freight on both the Lehigh and the Schuylkill navigations, is less than one cent per ton per mile; and there appears no reason to assume that the freight on the State and Tide canals, when the trade is organized, will be higher than one cent per ton per mile. Therefore the freight and toll from Port Lyon to Harrisburg, eight miles, is . . .	0 12
Cost at Harrisburg, 21 miles, . . .	$1 32
From Harrisburg to Middletown, nine miles,	0 14
Cost at Middletown, 30 miles, . . .	$1 46
From Middletown to Columbia, 18 miles,	0 27
Cost at Columbia, 48 miles, . . .	$1 73
The toll on the Tide Water canal, is, by its charter, the same as on the Pennsylvania canal: the freight also will doubtless be the same.	

mills per mile per 1,000 lbs. In the table of rates of toll of the Susquehanna and Tide Water canals, mineral coal is also charged at the same rate per 1,000 lbs. Now, as the coals brought down these canals from the three great coal regions, are mined by the ton, transported to the landings by the ton, freighted by the ton, and are bought and sold by the ton (of 2,240 lbs.) it will certainly be equally inconvenient to the payers and receivers of toll, and occasion extra trouble on all sides, if a deviation from universal custom is introduced, and a scale not used by the trade is adopted in the matter of toll. In the two great channels for the conveyance of anthracite to market, the Lehigh and the Schuylkill navigations, the toll is levied on each ton, and not per 1,000 lbs. It would be most to the convenience of all the parties concerned, were the same system continued here.

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Cost at Columbia brought forward, .	$1 73
From Columbia to tide at Havre de Grace, 45 miles, ...	0 70
Cost at Havre de Grace, 93 miles, . .	$2 43

It is believed that it would cost rather less to deliver this coal at Baltimore than at Delaware city, on account of the toll in the canal. The Chesapeake and Delaware Canal Company are disposed to lessen the toll on coal through their works when a business shall be established.

From Havre de Grace to Delaware city, 38 miles, ...	0 60
Cost at Delaware city, 131 miles, . .	$3 03

Coal freights from Philadelphia to Baltimore by the Chesapeake and Delaware canal, are usually $1.10 per ton = 4 cents per bushel: for the present, the cost from Havre to Philadelphia, is calculated at the same. From Delaware city to Philadelphia, including unloading, 42 miles: estimates have been made as low as 25 cents, but we will say . . . . .

	0 50
Cost on the wharf at Philadelphia, 173 miles, exclusive of rent or profit, . . .	$3 53

Cost of delivering this Coal at Baltimore.

Amount of expenses for mining and transportation, when delivered at Havre de Grace from Rattling Run, 93 miles, $2 43 per ton.

From Havre de Grace to Baltimore, by boat or sloop navigation by the

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Brought forward . .	$2 43 per ton.
Chesapeake, 54 miles, including unloading. We do not yet know the cost at which boats can convey coal to Baltimore; we have seen it stated as low as 25 cents per ton, but say	0 40 „
Cost at Baltimore delivered on the wharf, 147 miles, on the calculation of a certain amount of trade, and exclusive of rent of the mines, . . .	$2 83 „

It appears very unlikely, and even impossible, that bituminous coal can be delivered here at so low a rate as the foregoing, from any other known position. The nearest coal approaching to this quality is in the Cumberland region, 88 miles further than this distance, including 48 miles of rail-road. In the prospectus of the George's Creek Coal Company, an estimate is exhibited of $4.39, as the cost per ton, exclusive of profit, of mining and delivering coal, 207 miles at tide water at Georgetown; from whence it is about 40 miles by rail-road to Baltimore, in all 247 miles. Or if by sloop navigation down the Potomac and up the Chesapeake, by sloop navigation, the distance from Georgetown to Baltimore being about 225 miles, in all 432 miles from the mines.

If the Baltimore and Ohio rail-road route is selected for the transportation of the Cumberland coal, there would be 82 miles of rail-road at the eastern part of the line, and the George's Creek rail-road, 20 miles, or the Frostburg rail-road, 10 miles, at the western end, with an intervening 120 miles of canal; in all 218 to 228 miles of transportation to Baltimore. With-

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out entering into additional details, it seems obvious that at the minimum scale of charges on any of these modes, the cost of the Cumberland coal will preponderate over that of Stony Creek, at Baltimore.

From the best information that can be obtained of the prices of bituminous coals in Philadelphia, in the fall of 1839, and spring of 1840, they are as follows:

Susquehanna coal, 25 to 29 cents per bushel, now somewhat less, or	$7 50 to 8 70		per ton.
Virginia coal, 25 to 27 cents per bushel, cargo prices,	7 50 to 8 10		do.
Sydney coal, (duty six cents per bushel,) on board at the wharf,	7 00	——	do.
Pictou coal, (duty six cents per bushel,) the inferior at 15 cents per bushel,	5 00	——	do.

In New York—Cargo prices.

Liverpool coal, (duty six cents per bushel,) $10 50 to $11 per chaldron, or		8 50	do.
Scotch coal, (duty six cents per bushel,) $10 50 to $11 per chaldron,		7 00	do.
Pictou and Sydney coal, (duty six cents per bushel,) $10 50 to $11 per chaldron,	7 50 to 8 00		do.
Virginia coal,	8 00 to 8 50		do.

The retail price of broken and screened anthracite in 1839, has been from $5.50 to $6.00 per ton; to which must be added 50 cents per ton for hauling from the Schuylkill.

Wilkesbarre anthracite commonly sells for $4 per ton at Columbia.

RENTAL VALUE OF STONY CREEK BITUMINOUS COAL.

In order to arrive at the value of the coal in the ground at Stony Creek, as compared with that of

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other bituminous coal districts, it will be only necessary to shew the increased distance of the latter from the same market; the main routes being similar. That of the west branch of the Susquehanna river furnishes at present the largest supply. Karthaus is 322 miles distant from Philadelphia by the Tide Water canal and the Delaware. Clearfield is 360 miles by a similar route: but the system of internal improvement has not yet quite reached these places. Philipsburg central coal mines are 294 miles, including 27 miles of proposed rail-road over the Alleghany mountains. The Portage rail-road coal also passes over the Alleghany mountain, from about the same distance from Philadelphia as Karthaus. Stoney Creek mines at Rattling Run, being only 173 miles from Philadelphia, the diminished cost of its coal to the proprietors, as compared with those other positions, would be in the following proportion—with the understanding that the rates of freight and toll on the canals, and the prices of the coal, would be similar.

Blair's Gap coal district,	about 149 miles further,	$2 32	per ton.
Clearfield do.	187 miles,	2 91	do.
Karthaus do.	149 miles,	2 32	do.
Philipsburg do.	94 miles canal, 27 rail-road,	2 03	do.
Broad Top Mountain do.	122 miles,	2 00	do.
Lycoming Creek do.	105 miles,	1 88	do.

Hence it appears that, whatever may be the value of Stony Creek coal, and whatever the cost of its delivery at a given point, that of more remote positions is charged with an additional expense, amounting to from 50 per cent. upwards. The difference being in favour of Stony Creek, is equivalent to so much *extra value of the coal in the earth there.* Thus its value is greater by $2.00 per ton than of Broad Top moun-

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tain; by $2.03 per ton than that of Philipsburg; by $1.88 than the Lycoming Creek coal; by $2.32 than the Blair's Gap and Karthaus coal; and by $2.91 than the Clearfield coal, supposing the public canals and branch rail-roads are finished to those points, and that the prices of coals from thence are equal in the market. A person mining, on lease, coal at Stony Creek, at $2.32 per ton, would be on the same relative terms as if he paid nothing in the shape of rent at Karthaus or Blair's Gap. He would even be in a better position at Stony Creek, under this rent charge, because he could carry on the business with at least 50 per cent. less of capital.

The foregoing sketch of the advantages peculiar to the Stony Creek coal, is exhibited less with a view to recommend the Company to embark in the business *as miners*, than to advise their leasing out their coal to others. It appears certain, on reviewing all circumstances, that it is their interest to act only *as proprietors;* contenting themselves with rent from their property, and leaving to others the profit of trading in coal. Experience proves in all trades the advantage of the division of labour, and in none more than that under consideration. By granting rights of mining coal, at a fair rent, the Company receive a proper return from its property, while the mere savings resulting from the economy with which individuals conduct their operations, would give to the lessee a full return for his time and capital. It is even probable that the Company would receive a larger sum in the shape of rent, than it would be likely to do in the form of profit.

With these impressions I have wished to direct the attention of the stockholders to the extraordinary ad-

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vantages of this property as a source of rent—the form in which it would require least superintendence, and be subject in the smallest degree to disappointment.

The expense of bringing a bushel of Clearfield coal to tide, cannot be estimated at less than 15 cents, or from $4.60 to $4.80 per ton. That of the Cumberland region will probably be about the same. The Richmond coal now bears about a similar price for mining and transporting to tide. These prices, it will be observed, are the actual cost of producing the coal at tide water, *without any charge of rent.*

When their rail-road shall be completed, the Dauphin and Susquehanna Coal Company can deliver coal at tide water at a cost of $2.43 per ton. In this sum the cost of the rail-road, the wharves at Port Lyon and Havre de Grace, and other works, is excluded, as forming part of the capital invested in the estate. Here then is a difference, as we have shewn by another process, of $2.00 per ton, in favour of the Stony Creek coal. To the miner, therefore, this coal would be better worth a rent of $2.00 a ton than the other mines, situated as we have described, without charge of rent: and so long as these others pay any rent whatever, must the miners of the Stony Creek coal pay an equal sum, over and above this sum of $2.00 per ton, to maintain a parallel position. If coal be worth at Clearfield a rent of one cent per ton, it must be worth at the Dauphin mines two dollars and one cent. The accuracy of this view cannot be questioned. It is a necessary consequence of the favourable position of the one site over the other.

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To illustrate this by a case in point. The proprietors of anthracite at and near Pottsville, surrounded as they are by other bodies of coal land of equal value, obtain a rent, varying from 20 to 60 cents per ton, according to distance from landing. If such be the differences produced by a variation of 6, 8 or 10 miles, what should be that produced by a difference of 120 to 180, or 200 miles? If the vicinity to Pottsville affords advantages so important, what must be the advantage of a district 130 to 173 miles from Philadelphia, 93 miles from tide water, and 147 miles from Baltimore, (in fact only 98 miles from the latter by the York Haven rail-road,) connected with these places by canals, river navigation and rail-roads, when compared with positions one or two hundred miles in the rear?

I cannot, therefore, doubt the correctness of the previous assertion, that the bituminous coal in your land, when the improvements are completed and the mines are opened, is worth $2.00 per ton in the land, from year to year, and that while any other coal of this description can be mined at all elsewhere, the miners holding under this Company can pay that sum as rent for the use of land, rail-road, wharves, &c. free from any deduction except that of maintaining this road, making new tunnels or openings, and the ordinary expenses of supervision.

It will not be an extravagant estimate that during the ten years after the works and communications are effected, a million of tons may be brought down to the Pennsylvania canal and disposed of, being an average of 100,000 tons per annum.

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A rent charge of one dollar per ton, would therefore produce $100,000

From this deduct estimated reparation of roads, wharves, &c. $20,000

New works, tunnels, &c. 10,000

Salaries, agency, and expenses, 10,000

$40,000

Being equal to 12 per cent. upon the capital of the Company.

A rental of $1.50 per ton, subject to the like deductions, would, on the same scale of trade, produce 22 per cent. on the capital.

A rental of $2.00 per ton, would be equal to 32 per cent.

It has been shewn, by the closest calculation that the circumstances enable me to form, that about fifteen millions of tons of coal, of a semi-bituminous character, exist under this estate at the proposed water level. This quantity, if worked out at the rate of 100,000 tons annually, would be sufficient to meet the demand for one hundred and fifty years, independently of the anthracite on the Stony Creek estate, which will, on the same scale, afford a supply for two hundred and fifty years more.

Reasons have been given, however, for expecting a progressive augmentation of demand, especially if the coal be employed on the spot in the production and manufacture of iron. A high furnace, making 80 tons of metal per week, would require 10,000 to 12,000 tons of coal per annum. To convert this pig into bar iron and other purposes, it will consume about 9,000 tons of coal more; making in all 20,000 tons.

Independently, therefore, of the demand for this

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coal for the more distant markets, after the Stony Creek mines are brought into activity, the time cannot be very remote that a large demand, beyond what we have assumed, will arise from the various departments of iron manufactured in the heart of the district itself; giving value, not only to the coal, but to the iron ore, the water power, the timber, the agricultural lands, and the town and canal lots of Port Lyon; and thus adding largely to the rental above stated.

CONCLUSION.

In summing up what we have stated to be the condition, prospects, and value of the Company's estate, we find little to add beyond what has already been detailed, and is self-evident.

We should pay an ill compliment to the proprietors of the estate, and to the intelligence of the readers of this report, were we to insist with unnecessary earnestness on the value of circumstances, however favourable, which are already obvious to all who have taken the trouble to peruse these pages.

The principal local advantages then, which the Stony Creek coal district has in its favour, are readily recapitulated, and need no elaborate commendation from us; because, fortunately, they are, as we conceive, sufficiently prominent to recommend themselves. In glancing his eye over the present communication, the reader will perceive at once, the strong points of the case, and the advantages possessed by this locality for business operations in the two most useful productions in the world—coal and iron.

Under the sanction of a charter, conferring a power

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to hold ten thousand acres of land, to mine coal, and to make a rail-road to the different mines, the Company have devoted three years to the developement of this mineral property; have made roads, erected houses, sawmills, wharves, store-houses and other buildings of different descriptions; have investigated the hidden resources of this wild region; and have brought into view its valuable products, by means of tunnels, shafts, and other modes of exploration. All these operations, resources, and productions, brought to light chiefly in the progress of this investigation, form the principal matter of this report, and the details are illustrated by numerous diagrams and maps.

We will refer to these points in the order in which we have before enumerated them.

1. The site of the village of Port Lyon is singularly well situated for future importance; at the point of junction of the Pennsylvania canal, Stony Creek, the Susquehanna river, the Stony Creek rail-road, the proposed Sunbury rail-road, and probably that of the proposed Pittsburg rail-road, and also of two existing turnpike roads.

2. The newly constructed reservoir of fourteen acres, the sawmill and extra water power for forge, foundery, &c. on Stony Creek.

3. The value of this valley for its timber, which for more than twenty miles in length covers this area, in the wildest state of nature; it being now considered the best white oak, Spanish oak, chestnut, pine and poplar valley in the country. It will furnish the lumber for a rail-road, and will supply all possible demand for pit wood for the collieries.

4. The favourable character of this valley for a

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rail-road to bring down the coal from the several gaps in the mountain, as detailed in this and the Engineer's Report. The materials exist on the estate itself, along the line selected.

5. The amount of coal already ascertained within the basin of Short mountain.

6. The peculiarly valuable character and properties of this coal; the numerous gradations in its nature, structure, compactness, density, relative amounts of carbon and gaseous or volatile matter, in advancing from west to east; and consequently, its extended adaptation to various objects of operative usefulness.

7. The local advantage of position; being one hundred and twenty miles nearer to tide and to market than the nearest bituminous coal elsewhere in the state.

8. The ground whereon we have based an approximate estimate of between two and three millions of tons of bituminous coal above water level in the gap of Rattling Run, and from four to five millions of tons above water level at Yellow Springs Gap.

9. The additional coal to be worked from Rattling Run Gap, below the present water level of the other part of the land, estimated at three millions of tons more; and finally, the means of obtaining by a yet lower system of working, by tunnels and adits, five millions of tons more; making the total amount of coal beneath the Company's estate, fifteen millions of tons, above that level.

10. The iron ores, of which three different kinds exist here.

11. The adaptation of this property, as will be seen from the foregoing considerations, as well as from others previously detailed, for the purposes of a national foundery.

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12. The facilities afforded, when the proposed arrangements shall have been completed, for transporting the coal, iron ores, iron, lumber, lime, and other materials, to and from this property, in various directions by canals and rail-roads.

13. In addition to all these, the prospect of an enlarged demand for coal; not alone for ordinary consumption and for exportation, but as a necessary ingredient in the improved process of manufacturing iron on the spot.

14. Lastly, considerations have been presented relative to the future management of this property and for securing an adequate return for the capital and labour expended upon it; and reasons have been submitted for recommending the Dauphin and Susquehanna Coal Company to enter neither into coal operations themselves, nor into the business of mining, nor the transportation, nor the retailing of coal; but rather to grant leases of their mineral lands to others, for all such purposes.

Respectfully,

RICHARD C. TAYLOR.

Philadelphia, May 1, 1840.

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APPENDIX.

(A.)

AN ACT

TO INCORPORATE

The Dauphin and Susquehanna Coal Company.

Passed the 5th day of April, 1826.

Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same, That Benjamin Kugler, Charles Bird, John Goddard and Joseph Lyon, and such persons as they shall associate with them, be and they are hereby declared to be a body politic and corporate, in law and in fact, by the name, style and title of the "Dauphin and Susquehanna Coal Company," and by that name, style and title, they and their said associates, shall have continual succession, and be able to sue and be sued, implead and be impleaded, in all courts of record and elsewhere, and to purchase, receive, have, hold and enjoy to them and their successors lands, tenements and hereditaments, goods, chattels and all estates, real, personal or mixed, of what kind or quality soever, and the same from time to time to sell, mortgage, grant, alien or dispose of, and to make dividends of such portions of the profits as they may deem proper, and also to make and have a common seal and the same to alter or renew at pleasure, and also to ordain, establish and put in execution such by-laws, ordinances and

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regulations, as shall appear necessary and convenient for the government of the said corporation, not being contrary to the constitution and laws of the United States or of this commonwealth, and generally to do all and singular the matters and things which to them it shall lawfully appertain to do for the well being of the said corporation and the due management and ordering the affairs of the same: *Provided*, That nothing herein contained shall be considered as in any way giving to the said corporation any banking privileges whatever, or any other liberties, privileges or franchises, but such as may be necessary or incident to the effectual prosecution of the coal trade: *Provided*, That the company shall hold no lands except they are situated on *Short Mountain* or on *Stony Creek*, and that the quantity of land to be held by said company shall not exceed at any time *ten thousand acres.*

SECT. 2. *And be it further enacted by the authority aforesaid*, That the said coal lands, landings, wharves, buildings and other estate whatsoever, necessary or convenient for the carrying on of the said coal trade, which shall be on or before the first day of September next conveyed or cause to be conveyed, in fee simple, to the said corporation, by the said Benjamin Kugler, Charles Bird, John Goddard, and Joseph Lyon, and such persons as they shall associate with them, their heirs, executors, administrators and assigns, shall form a common stock, and be divided into a convenient number of shares, and apportioned by the said corporation among the contributors, according to their respective interests, for which certificates of stock shall be issued, and be assignable and transferable in such way, and subject to such conditions as the said corporation may from time to time prescribe; and the said shares of stock so created shall be, for all legal purposes whatever, deemed and treated as personal estate.

SECT. 3. *And be it further enacted by the authority aforesaid*, That before the said lands are put into the stock, so as to form any part of said stock, the owner or owners of said land shall apply to the Court of Common Pleas of Dauphin county, whose duty it shall be to appoint three disinterested freeholders, not residing within the county of Dauphin, to view, and under their oaths or affirmations put a fair valuation on the said lands, and make a return under the same, to the said court, there to be filed of record; and if the said court shall consider the said valuations as just and equitable, and shall confirm the same, the said valuation and lands shall be put

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into the stock as a part thereof; but if the said court shall not confirm the same, then they shall appoint other freeholders to value the said lands, who shall be subject to the provisions of this act; the viewers shall receive from the owner or owners of said land, two dollars each, for every day they shall be employed in said service.

SECT. 4. *And be it further enacted by the authority aforesaid,* That before the said company shall claim the benefits and advantages of this act, they shall appoint three commissioners to receive subscriptions to a stock consisting of at least one thousand shares, of fifty dollars each, and not exceeding six thousand shares, to be taken in the manner and under similar regulations as is prescribed by the second section of an act passed the twenty-first day of March, one thousand eight hundred and fourteen, entitled "An act regulating banks," and whenever one thousand shares shall have been bona fide subscribed, and twenty-five dollars on each share shall have been paid to said commissioners, the said commissioners shall certify the same, under oath or affirmation, to the governor of this commonwealth, and on the receipt of such certificate, the governor shall certify under the seal of the state, that said company has complied with the conditions entitling it to all the privileges and benefits of this act, it being understood that the capital allowed by this act, so much of it shall be first applied to the purchase of the lands which the said company hereby incorporated is authorized to hold, agreeably to the valuation provided for in the preceding section of this act, and the remainder to the furtherance of the object, and in the manner pointed out and allowed by the said law.

SECT. 5. *And be it further enacted by the authority aforesaid,* That the better to carry on the business of mining and transporting coal on an extensive scale, and generally to meet the charges and expenses incident thereto, there shall be paid by every stockholder, as aforesaid, for each and every share held by, or belonging to him, her or them, such assessment as the stockholders in general meeting may deem expedient and proper, to be payable in such instalments as they may require, which said instalments, when called for, besides being a debt due from the original stockholder and his assigns, respectively, shall remain a charge or lien on the said several shares until the same be fully paid; and every instalment so paid, shall be considered as forming an integral part of the

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said shares respectively: *Provided*, That the whole amount of the monied capital so as aforesaid, levied and collected by the said company, shall not exceed *three hundred thousand dollars: And provided also*, That it shall not be lawful for the said company to interfere in any manner with the waters of Clark's Creek, or for the said company or their workmen or agents, to enter on the estate of any person or persons, without the license and consent of the owner, or in any manner injure or affect the rights of any person or persons without such license and consent.

SECT. 6. *And be it further enacted by the authority aforesaid*, That for the well ordering of the affairs of said corporation, there shall be chosen by ballot, at such time and place as the stockholders in general meeting determine, and annually, on the same day thereafter, by a plurality of votes of the said stockholders, nine directors, a majority of whom shall be a quorum, who may appoint such officers or other persons as may be deemed by the by-laws, or as the said board of directors may think expedient, for the good ordering of the affairs of the said company, and in case of an equality of votes for two or more persons, the directors elect shall supply the deficiency by ballot, and the said board may also fill for the remainder of the year any vacancy that may occur by death, resignation or otherwise, and no person shall be a director, agent or superintendent, of this and any other coal company at the same time: *Provided*, That if the said election for directors shall not take place on any day on which the same ought to be held, it shall be lawful on any other day, as soon as may be, to hold the same, in such manner as may be regulated by the by-laws and ordinances of said corporation: *And provided*, That no stockholder shall be entitled to vote on any stock which shall not have stood in his or her name at least ninety days preceding such election.

SECT. 7. *And be it further enacted by the authority aforesaid*, That the board of directors or any number of stockholders, being together the proprietors of not less than one-fourth of the whole stock, shall have the power for all the purposes relative to the corporation, to call a general meeting of the stockholders, giving at least twenty days' notice thereof, to be served either personally or by public advertisement, in two of the newspapers printed in Philadelphia, and in two of the newspapers printed in Harrisburg; and at all general meetings, as well as at elections for directors, the

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number of votes each stockholder shall be entitled to, shall be according to the following scale, viz: every share not exceeding five, shall have one vote: for every other five shares, two votes, to be given in person or by proxy, constituted in writing.

SECT. 8. *And be it further enacted by the authority aforesaid,* That dividends of so much of the profits of the institution as shall appear advisable to the directors, shall be declared at least twice a year, in every year, and paid to the stockholders on demand, at any time after the expiration of ten days therefrom, but they shall in no case exceed the amount of the nett profits actually acquired by the company, so that the capital stock shall never be thereby impaired; if the said directors shall make any dividend which shall impair the capital stock of said institution, the directors consenting thereto, shall be liable in their individual capacities to the said company, for the amount of the stock so divided, and each director present, when such dividend shall be made, shall be adjudged to be consenting thereto, unless he forthwith enter his protest on the minutes of the board, and give public notice to the stockholders of the declaring of such dividend.

SECT. 9. *And be it further enacted by the authority aforesaid,* That this act shall be and continue in force, until the first Monday in March, in the year one thousand eight hundred and forty-one, and no longer.

SECT. 10. *And be it further enacted by the authority aforesaid,* That the legislature reserve the right to revoke, alter or annul the charter hereby granted, at any time they may think proper.

JOSEPH RITNER,
Speaker of the House of Representatives.

ALEXANDER MAHON,
Speaker of the Senate.

APPROVED—the fifth day of April, one thousand eight hundred and twenty-six.

J. ANDW. SHULZE.

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(B.)

SUPPLEMENT

To an Act entitled "*An act to incorporate the* DAUPHIN AND SUSQUEHANNA COAL COMPANY," passed April the fifth, eighteen hundred and twenty-six.

Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same, That the charter of the Dauphin and Susquehanna Coal Company shall be, and it hereby is, continued and extended *twenty years* from the passage of this act—and the capital stock of the said company may be increased so as to consist of *ten thousand shares of fifty dollars each* and no more, with full power and authority to make and construct a *rail-road or canal* along Stony Creek, on the lands of the said company, and for that purpose to borrow such sums of money as may be required, not exceeding in the whole *two hundred thousand dollars*, and to convert the same into *capital stock* of the said corporation.

Provided, That any stockholder of the said company shall be eligible as a director thereof, and that any thing in the original act which is now altered or supplied is hereby repealed:

And provided further, That whenever the dividends of the said company shall exceed six per cent. per annum, they shall pay a tax of eight per cent. on all such dividends into the treasury of the state, for purposes of education.

(Signed) LEWIS DEWART,
Speaker of the House of Representatives.
CHARLES B. PENROSE,
Speaker of the Senate.

Approved the sixteenth day of April, Anno Domini one thousand eight hundred and thirty-eight.

(Signed) JOSEPH RITNER.

Office of the Secretary of the Commonwealth,
Harrisburg, May 23d, 1838.

This is to certify that the above and foregoing is a true and correct copy of the original law on file in this office.

Witness my hand and the seal of the said office the day and year aforesaid.

(Signed) J. WALLACE, (L. S.)
Deputy Secretary.

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(C.)—TABLE V.

Schedule of the Lands comprised within the corporate Estate of the Dauphin and Susquehanna Coal Company.

No.	Warrantee Names.	Quantity. Acres.	Rods.	County.	Townships.
28 b	George Gardner, (part of,)	42	00	Lebanon.	East Hanover.
32 b	Adam Rapp, (part of,)	60	00	do.	do.
34	Jacob Yeager,	477	66	Dauphin.	Rush.
35	Peter Wingert,	398	07	Lebanon.	East Hanover.
36 b	Andrew Eisenbise, (part of,)	136	41	do.	do.
40 b	John Weldy, (part of,) including Stony Creek,	110	00	Dauphin.	Rush.
41	George Seitz,	397	117	do.	do.
42	Michael Madeira,	448	55	do.	do.
75 b	Thomas Bird, (part of,)	140	00	do.	do.
76	William Strickland,	412	73	do.	do.
77	George Handy,	406	80	do.	do.
78	John R. Neff,	405	80	do.	do.
79	Frederick Ball,	431	80	do.	do.
80	George W. Neff,	440	00	do.	Middle Paxtang.
81	Seith Craig,	411	80	do.	do.
84	Thomas C. Price,	432	00	do.	do.
85	Henry Sloane,	440	00	do.	do.
87	Jacob Weiss, Jr.	425	00	do.	do.
88	Melchior Rahm,	440	00	do.	do.
89	James Connor,	140	60	do.	do.
91	Jacob Boas and J. Green,	124	00	do.	do.
94 a 94 b	James Watt,	24	100	do.	do.
95	William Murray,	106	00	do.	do.
96	John Wyeth,	48	120	do.	do.
97	William Johnson,	33	00	do.	do.
98	James Bell,	8	114	do.	do.
104	John Cochran,	105	50	do.	do.
105	Robert M'Cord,	22	83	do.	do.
106 a	Thomas Sturgeon, (part of,)	21	40	do.	do.
106 b	Town Plot, unsold,	15	00	do.	do.
107	William Ross,	2	04	do.	do.
109	John Gross,	213	73	do.	do.
110	James Brooks,	208	00	do.	do.
111	Richard C. Taylor,	4	147	do.	do.
112	Innis Green,	400	122	do.	do.
113	John Wyeth and Wm. Smith,	433	80	do.	do.
114	Abiathar Hopkins,	494	20	do.	Rush.
115	John Buffington,	383	00	do.	do.
116	Leidig & Brightbil, Yellow Springs Tract,	450	00	Lebanon.	East Hanover.
117	Cold Spring Tract, John Cuthbertson,	23	106	do.	do.
	Total,	9717	38		

Also, for the greater convenience of approaching or mining any Coal veins within the Company's lands, the right of entrance and passage, by means of tunnels, drifts, roads, shafts, or other works that may be found necessary therefor, on, through, or under all or any of the following tracts belonging to the Stony Creek Coal Estate, viz: Nos. 75 a, 82, 83, 86, 90, 92, 93, 99, 100, 101, 102 and 103; together with the right of passage by rail-road or other road through and over all or any of the thirty-eight tracts conveyed to the Trustees of the Stony Creek Coal Estate; or of using, on certain conditions hereinafter set forth, any rail-road or other road which may be made by the said Trustees, or by persons holding under them, on any of the said thirty-eight tracts.

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(D.)—TABLE VI.

Illustrative of the Statistics of the Coal Trade of Pennsylvania,

Shewing the comparative distances from the Collieries, both Anthracitous and Bituminous, in this and adjoining States, to tide water and the principal markets. Accompanied by a Map shewing the relative positions of the Coal fields, and the respective avenues from thense to market.

Localities of Coal Mining Stations.	Miles from the Mine.	Route Detailed.	Description of Coal.
To Tide Water *From Stony Creek Coal Region.*		at Havre de Grace.	
Port Lyon or Dauphin,	80	Harrisburg 8, Middletown 9, Columbia 18, Havre de Grace 45.	South coal region.
West point of Short mountain coal,	82	To Dauphin 2, Penna. canal 35, lockage 94 feet; Tide Water canal 45, 29 locks, 233 feet lockage.	Bituminous.
Six mile coal openings,	86	Dauphin 6, Penna. canal 35, Tide Water canal 45.	Do.
Big Flats mines,	89	Do. 9 do. do.	Do.
Rattling Run mines,	93	Do. 13 do. do.	Do.
Yellow Springs mines,	96	Do. 16 do. do.	Do.
Cold Spring central openings,	98	Do. 18 do. do.	Do.
Rausch Gap mines by Stony Creek,	101	Do. 21 do. do.	Do. Transition.
Do. crossing 2nd mountain to Big Dam,	108	Rail-road 3½, Union canal 41½, Pa. 18, Tide Water canal 45.	Do.
Do. by Fishing Creek to Port Mifflin,	119	Do. 10 do. 46½ do. 18 do. 45.	Do.
Do. by Indian Creek Gap,	99	Do. 10 do. 26 do. 18 do. 45.	Do.
Gold Mine Gap by Stony Creek,	105	Do. 25 do. 35 do. 45.	Anthracite.
Do. by Fishing Creek,	115	Do. 6½ do. 46½ do. 18 do. 45.	Do.
Black Spring Gap by Stony Creek,	106	Do. 26 do. 35 do. 45.	Do.
Do. by Fishing Creek,	114	Do. 4½ do. 46½ do. 18 do. 45.	Do.
Lykens Valley mines,	116	Do. 16, Wo. Feed. & Pa. can. 55 do. 45.	Do.
Bear Valley mines by Wiconisco Feeder,	125	Do. to Millerstown 26, do. 55 do. 45.	Do.
Do. by Mahantango Creek,	135	Do. 10, Slackwater 17, Havre 108.	Do.
Do. by Schuylkill Cy. and Stony Creek,	120	Do. 15, Stony Creek Rail-road 25, Canals 80.	Do.
West Mahanoy mines,	126	Do. 26, Feeder 12, Canals 88.	Do. Middle coal reg.
Swatara coal district—Lorberry Cr. Big Vein,	120	Do. 5, Union canal 52, Penna. canal 18, Tide 45.	South region.
Do. by Fishing Creek Gap,	117	Do. 7, Union and Tide canals 109½.	Do.

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Swatara coal district by Stony Creek,	111	Do. 31, Penna. canal 35, Tide 45.	Anthracite.
Do. Good Spring Creek, - -	121½	Do. 12, do. 46½, Havre 63.	Do.
Wyoming coal field—Plymouth mines,	186	Pennsylvania canal 141, Tide Water 45.	Do. North region.
Do. Wilkesbarre mines, - -	193	Rail-road 2, do. 146, do. 45.	Do.
Do. Lackawannack, - -	200	Pennsylvania canal 155, do. 45.	Do.
Shamokin mines, - - -	143	Do. 15, Dauphin 48, Havre 80.	Do.
Alleghany coal—Loyalsock, - -	172	Rail-road 15, Canals 157.	Bituminous.
Lycoming Creek mines, - - -	196	Do. 25 do. 171.	Do.
Farrandsville, - - - -	202	Do. 1 do. 201.	Do.
14 miles above Dunnstown, - - -	208	Pennsylvania canals 163, Tide canal 45.	Do.
Mouth of Sinnemahoning, - -	231	Northumberland 103, Dauphin 48, Havre 80.	Do.
Karthaus mines, - - - -	253	By Susquehanna 22, and canals 231.	Do.
Clearfield, - - - -	291	By do. 60 do. 231.	Do.
Philipsburg *old mines*, - - -	221	Rail-road 33½, Penna. canals 142½, Tide 45.	Do.
Do. Coal Hill, - - -	214½	Do. 27 do. 142½ do. 45.	Do.
Above Blair's Gap, - - - -	235	Do. 17 do. 173 do. 45.	Do.
Blossburg, Tioga, - - - -	211	Do. 40, Canals 171.	Do.
Broad Top mountain, - - -	201	Do. 25, Penna. canals 131, Tide canal 45.	Do.
Do. - - - -	216	Slackwater navigation and canals.	Do.
To Tide Water		**at Philadelphia.**	
Port Lyon or Dauphin - - -	135	By Stony Creek, Schuylkill Haven, and Reading rail-road.	South Region.
Do. - - - - -	133	Do. Port Clinton, do.	Bituminous.
Do. - - - - - -	116	Harrisburg and Lancaster rail-road.	Do.
Do. - - - - -	159⅝	By Tide canal 80, Delaware 79⅛, lockage 327 feet.	Do.
Do. - - - - -	159	By Pa. 17, Union 80, and Schuylkill canal 62, lockage 738 feet.	Do.
Six mile openings, - - - -	122	Harrisburg 14, Lancaster rail-road 108.	Do.
Do. - - - - -	123	Rail-road 6, Columbia canal 35, Rail-road 82.	Do.
Do. - - - - -	166	Do. 6, Havre 80, Delaware city 38, Philadelphia 42.	Do.
Do. - - - - -	165	Do. 6, Union 80, Penna. 17, Schuylkill Canal 62.	Do.
Do. - - - - -	144	Do. 6, Havre 80, Wilmington rail-road 58.	Do.
Big Flats, - - - - -	125	Do. 9, Lancaster rail-road 116.	Do.
Rattling Run Gap, - - -	129	Do. 13 do. 116.	Do.
Do. - - - - -	173	Do. 13, Havre 80, Delaware 80.	Do.
Do. - - -	172	Do. 13, Union canal 80, Penna. canal 17, Schuylkill 62.	Do.

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Localities of Coal Mining Stations.	Miles from the Mine.	Route Detailed.	Description of Coal.
To Tide Water		at Philadelphia.	
Yellow Springs,	132½	Rail-road 16½, Harrisburg 8, Lancaster rail-road 108.	Bituminous.
Do.	142½	Do. Port Mifflin 14, Union and Schuylkill canals 128½.	Do.
Do.	175½	Do. Stony Creek 16½, Penna. canal 17, do. 142.	Do.
Rausch Gap,	137	Do. 21, Harrisburg 8, Lancaster rail-road 108.	Transition.
Do.	138½	Do. Port Mifflin 10, Union and Schuylkill canals 128½.	Do.
Do.	126½	Do. Trout Run at Big Dam 3½, do. 123.	Do.
Do.	126	Indian Creek Gap 10, Union and Schuylkill canals 116.	Do.
Do.	112	Schuylkill Haven and Reading rail-road.	Do.
Do.	110	Port Clinton and do.	Do.
Do.	107	Trout Run 3, Rail-road to Philadelphia 104.	Do.
Do.	180	Stony Creek 21, Middletown 17, Union and Schuyl. canals 142.	Do.
Gold Mine Gap,	141	Do. 25, Lancaster rail-road 116.	Anthracite.
Do.	131	Trout Run 8, Canals 123.	Do.
Do.	134½	Port Mifflin 6, Union and Schuylkill canals, 128½.	Do.
Black Spring Gap,	108	Pinegrove 8, Schuylkill Haven 14, Reading rail-road 86.	Do.
Do.	122	Do. 8 do. 14, Canal 100.	Do.
Do.	104	Do. 8, by Port Clinton 23, and Reading rail-road 73.	Do.
Do.	118	Do. 8 do. 23, Canal 87.	Do.
Do.	107	Port Mifflin 4½, Rail-road 48½, Reading rail-road 54.	Do.
Do.	133	Do. 4½, Union and Schuylkill canals 128½.	Do.
Do.	185	Stony Creek 26, Middletown 17, Canals 142.	Do.
Mount Eagle, next county line,	134	By Union and Schuylkill canals.	Do.
Swatara District. Lorberry Creek Big Vein,	139	Rail-road 5, Union 72, lock. 399 ft.; Sch. canal 62, lock. 182 ft.	Do.
Do.	136	Fishing Creek rail-road 7½, Union canal 66½, Schuyl. canal 62.	Do.
Do.	108	By Schuylkill Haven and Canal.	Do.
Do.	103	By Port Clinton and Reading rail-road.	Do.
Do.	109	Swatara Gap and Rail-road to Reading and Philadelphia.	Do.
Good Spring Creek,	144	Railroad 10, Canals to Philadelphia 134.	Do.
Pottsville 106—Port Carbon 108,	108	By Schuylkill canal, lockage 610 feet.	Do.
Do.	94	By Rail-road.	Do.

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Tamaqua,	99	By Rail-roads, *Port Clinton* 20, *Reading rail-road* 79.	Anthracite.
Do.	108	Little Schuylkill rail-road and Schuylkill canal.	Do.
Girardville,	119	Rail-road and Schuylkill navigation.	Second region.
Nesquehoning or Room Run,	130	Rail-road 5, Lehigh navigation 47, Canal 60, Philadelphia 18.	South region.
Mauch-Chunk—Summit mines,	134	Do. 9, Canals 125, *in 52 ton boats.*	Compact anthracite.
Beaver Meadow mines,	145	Do. 26 do. 119.	Do. Second region.
Hazelton,	149	Do. 30 do. 119.	Do.
Buck mountain,	144	Do. 4, Lehigh navigation 62, Philadelphia 78.	Do.
Wilkesbarre mines,	171	Do. 20 do. 73, Delaware 60, Phila. 18.	North region.
Do.	275	By Tide Water canal and Delaware.	Do.
Do. by Union canal,	275	Pa. canals 133, U. & S. canals 142; lock. 260+519+182=961 ft.	Do.
Plymouth,	265	By Tide Water canal.	Do.
Shamokin collieries,	223	Rail-road 15, Havre 128, Philadelphia by Delaware 80.	2nd Anthracite reg.
West Mahanoy coal,	206	Do. 26, Feeder and Canals to Havre 100, Philadelphia 80.	Do.
Lyken's Valley old mines,	155	Do. 16, Penna. canal 57, Columbia rail-road 82.	South region.
Do.	197	Do. 16, do. Middletown 39, Union and Schuyl. nav. 142.	Anthracite.
Do.	196	Do. 16, Feeder and Canals 116, Delaware to Philada. 80.	Do.
Broad Top mountain,	280	Do. 25, Penna. canals 113, Union canal 80, Schuyl. 62.	Br. Top reg. bitum.
Do.	295	Slackwater 40, Penn., Union and Schuylkill canals 255.	Do.
Alleghany Mountain—Loyal sock,	198	By Pottsville rail-road and Schuylkill canal.	Alleghany region.
Do.	190	By Cattawissa and Reading rail-roads.	Bituminous.
Do.	208	Rail-road 15, Pa. canal 85, Harrisburg & Lanc. rail-road 108.	Do.
Do.	182	By Pottsville and Reading rail-roads.	Do.
Do.	251	Rail-road 15, Penna. canal 94, Union & Schuyl. canals 142.	Do.
Towanda coal mines,	261	Do. 15, Wilkesbarre 75, Lehigh route 171.	Do.
Lycoming Creek,	241	Do. 25, Penna. canal 108, Lancaster rail-road 108.	Do.
Do.	213	By canal and Catawissa and Reading rail-roads.	Do.
Do.	205	By Pottsville and Reading rail-roads.	Do.
Do.	222	By Pottsville and Sunbury rail-road and Schuylkill navigation.	Do.
Do.	275	Rail-road 25, Penna. canal 108, Union and Schuyl. canals 142.	Do.
Farrandsville,	242	Do. 1, do. 133, Lancaster rail-road 108.	Do.
Do.	233	Do. Penna. canal and Pottsville rail-road and Schuyl. nav.	Do.
Do.	284	Rail-road 1, Penna. canal 141, Union and Schuyl. canals 142.	Do.
14 miles above Dunnstown,	289	Do. 2, to Middletown 145, do. 142.	Do.
Do.	247	Do. 2, Penna. canal to Columbia 163, Rail-road 82.	Do.

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Localities of Coal Mining Stations.	Miles from the Mines.	Route Detailed.	Description of Coal.
To Tide Water		at Philadelphia.	
Sinnemahoning mouth, - - -	315	Pennsylvania canals to Columbia 163, Rail-road 82.	Bituminous.
Do. - - - - -	258	By Erie and Lancaster rail-roads.	Do.
Do. - - - - - -	271	To Columbia by Penna. canal and rail-road to Philadelphia.	Do.
Do. - - - - - -	240	By Sunbury 103, Pottsville and Reading rail-roads 137.	Do.
Karthaus, - - - - - -	322	By Penna. canal and Union and Schuylkill canals.	Do.
Clearfield, - - - - -	360	do. do.	Do.
Philipsburg—centre mines, - - -	250	Rail-road 27, Penna. canal 115, Lancaster rail-road 108.	Do.
Do. - - - - -	293½	Do. 27 do. 124½, U. canal 80, Schuyl. canal 62.	Do.
Do. - - - - - -	294	Do. 27, Havre 197, Delaware to Philadelphia 80.	Do.
Blair's Gap, - - - - -	314	Do. 17, Penna. canal 155, Union and Schuyl. canals 142.	Do.
Do. - - - - - -	271	Do. 17 do. 146, Lancaster rail-road 108.	Do.
Do. - - - - - -	273	By Columbia rail-road.	Do.
Bear Valley coal district, - - -	206	Rail-road 26, Canals 100, Delaware to Philadelphia 80.	Anthracite.
Do. - - - -	214	Do. 10, Mahantango 17, Midn. 45, U. & S. canals 142.	Do.
Do. Klinger's Gap, - - -	201	Do. to Susquehanna 23, Canals 187.	Do.
Pittsburg via Dauphin, - - -	439	Penna. canal 297, Union 80, Schuylkill canal 62.	Bituminous.
Do. do. - - - -	396	Do. 288, Lancaster rail-road 108.	Do.
Do. via Chambersburg, - -	396	Pittsg. to Chamb. rail-road propd. 240, and Lanc. rail-road 156.	Do.
Do. via Clearfield, West Branch R. Rds.	397	Sinnemahoning 157, Sunbury 103, by Pottsville 137.	Do.
Do. West Branch, - - -	415	New Alexandria, Sinnemah. 117, Philadelphia 258.	Do.
Sinnemahoning mouth, - - -	267	Sunbury rail-road 103, Pa. canal 56, Lancaster rail-road 108.	Do.
Montezuma—New York canal, - -	347	By the Lehigh and Delaware route.	
Erie, (via Sunbury and Erie rail-roads,)	420	Lockhaven 220, Sunbury 63, by Pottsville 137.	
Do. via Lancaster rail-road, -	402	Warren 62, Sunbury 178, Harrisburg 54, Lancaster 108.	
Do. via Elmira, rail-road route, -	458	Elmira 205, Williamsport 73, Danville 42, Pottsville 63, Little Schuylkill 21, Reading rail-road 54.	
Lake Ontario, via Sunbury, - -	401	Montezuma, Williamsport, Pottsville, Reading rail-road.	
Cleaveland, Ohio, - - -	623	By canals, Pittsburgh, Chesapeake and Ohio, &c.	
Richmond, Virginia, Chesterfield coal	433	Rail-road or Canal 13, Fort Monroe 120, Philadelphia 300.	Bituminous.

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Port Lyon or Dauphin.			
To Pittsburg,	280	Penna. canal 138, Portage 37, Canal 105.	
Hollidaysburg,	138	Pennsylvania canal.	
New York and Erie rail-road,	161	Williamsport 88, Elmira 73.	
Erie canal at Montezuma,	245	Elmira 161, Seneca Lake 61, Montezuma 23.	
Buffalo, Lake Erie,	402	To Montezuma 245, Buffalo 157.	
Lake Erie,	366	To Elmira 161, Erie rail-road 205.	
Albany,	451	Montezuma 245, Erie canal 206.	
Lake Ontario,	309	Elmira and Montezuma 245, Oswego canal 64.	
To Tide Water		**at Bristol.**	
Wilkesbarre,	152	By the Lehigh navigation route.	North region.
Mauch Chunk,	116	Rail-road 9, Lehigh navigation 47, Delaware canal 60.	South region.
Room Run,	112	Do. 5 do. 47 do. 60.	Do. Anthracite.
Beaver Meadow,	127	Do. 27 do. 40 do. 60.	Middle region.
Northampton and Luzerne Company,	129	Do. 30 do. 39 do. 60.	Do. Anthracite.
Hazelton mine,	131	Do. 32 do. 39 do. 60.	Do.
Back mountain mine,	126	Do. 4 do. 62 do. 60.	Do.
Towanda coal district,	243	Do. 15, Wilkesbarre 75, Bristol 153.	Bituminous.
To Tide Water		**at Baltimore.**	
Port Lyon or Dauphin,	85	Canal 25, York Haven rail-road 60.	South region.
Do.	115	Canals to Havre 80, Balt. rail-road 35.	Do.
Do.	134	Do. 80, Chesapeake 54.	Do.
Stony Creek coal district—Six mile openings,	121	Rail-road 6, Canals to Havre 80, Balt. rail-road 35.	Bituminous.
Do.	91	Do. 6, and York Haven route 85.	Do.
Rattling Run,	147	Do. 13, Havre 80, Chesapeake 54.	Do.
Do.	98	Do. 13, York Haven route 85.	Do.
Rausch Gap,	104	Do. 10, by Indian Cr. and Union canal 26, Y. Haven 68.	Do. Transition.
Do.	106	By Stony Creek rail-road 21, and York Haven 85.	Do.
Do.	155	Do. 21, State canal and Chesapeake 134.	Do.
Do.	173	Do. by Union canal route.	Do.
Black Spring Gap,	160	Do. 26, Havre 80, Chesapeake 54.	Do. Anthracite.
Do.	149	By rail-road 4½, Union canal 46½, Havre 63, Balt. rail-road 35.	Do.
Do.	168	By Union canal 51, State canal 18, Tide 45, Chesapeake 54.	Do.

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Localities of Coal Mining Stations.	Miles from the Mine.	Route Detailed.	Description of Coal.
To Tide Water		**at Baltimore.**	
Wyoming region—Wilkesbarre, -	195	By canals and York Haven rail-road.	North region.
Plymouth, - - - - - -	222	Do. by Havre, Baltimore rail-road.	Anthracite.
Do. - - - - - -	241	Do. do. Chesapeake.	Do.
Wilkesbarre, - - - - -	232	Do. do. Baltimore rail-road.	Do.
Do. - - - - - -	251	Do. do. Chesapeake.	Do.
Do. - - - - - -	279	By the Lehigh and Delaware route, Bristol 152, Baltimore 127.	Do.
Alleghany mountain—Farrandsville, -	256	Havre 202, Chesapeake 54.	Bituminous.
Cumberland near Frostburg, - -	218	Rail-road 10, Canal 138, Rail-road 70.	Do.
Do. Westernport, - -	236	Do. 12 do. 138 do. 70.	Do.
Do. George's Creek, - -	240	Do. 12 do. 138 do. 70.	Do.
Philipsburg—Centre mines, - -	221	Do. 27. Canals and York Haven rail-road.	Do.
Do. - - - - - -	268½	Do. 27, Havre 187½, Chesapeake 54.	Do.
Berkley and Martinsburg, - -	170	By canal and Baltimore and Ohio rail-road.	Anthracite.
Wheeling, - - - - - -	339	National road to Cumberland 131, Canal 138, Rail-road 70.	Bituminous.
Pittsburgh, - - - - -	338	Monongahela 56, National rail-road 74, Canal & Rail-road 208.	Do.
		To Delaware City.	
From Port Lyon or Dauphin, - -	118	By canals.	Bituminous.
Do. Six mile openings, - -	124	Do.	Do.
Pottsville, - - - - - -	150	Schuylkill navigation and the Delaware.	Anthracite.
Mauch Chunk, - - - - -	176	Rail-road 9, Lehigh route 125, Delaware 42.	Do.
Lyken's Valley mines, - - - -	154	Do. 16, Havre 100, Delaware 38.	Do.
Farrandsville, - - - - -	240	Do. 1 do. 201, do. 38.	Bituminous.
To Tide Water *Stony Creek Coal District.*		**at Washington or Georgetown.**	
From Port Lyon or Dauphin, - -	153	Canals to Havre 80, Rail-road 73.	South region.
Do. - - - - - -	123	To York Haven 25, Baltimore 60, Washington 38.	Do.
Six mile openings, - - - - -	129	Rail-road 6, same route 123.	Bituminous.
Do. - - - - - - -	159	Do. 6, Havre 80, Rail-roads 73.	Do.

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Rattling Run,	166	Rail-road 13, Havre 80, Railroads 73.	Bituminous.
Rausch Gap,	142	By Indian Creek 10, Union canal 26, York Haven 106.	Transition.
Do.	191	Do 10, Havre 89, Chesapeake 54, Washington 38.	Do.
Do.	144	By Stony Creek 21, and Yorkhaven rail-road 123.	Do.
Berkley region,	150	By Ohio canal, Georgetown 1.	Anthracite.
Cumberland region near Frostburg,	197	By do. 187, Rail-road 10.	Bituminous.
Do. Westernport,	215	do. 187 do. 28.	Do.
Do. George's Creek,	219	do. 187 do. 32.	Do.
Do. 16 miles above Westernport,	231	do. 187 do. 32.	Do.
Farrandsville,	294	Havre 202, Baltimore 54, Washington 38.	Do.
Cleveland, Ohio,	523	By Pittsburgh and Chesapeake and Ohio canal.	Do.
Pittsburgh, (lockage 3,215 feet,)	342	Steamboat 83, National road 72, Ohio canal 187.	Do.
Richmond, Virginia, Chesterfield,	364	Rail-road 13, Sloop navigation 64, Ship navigation 287.	Do.
To Tide Water		**at New York.**	
Mauch Chunk—Summit mines,	157	Rail-road 9, Lehigh navigation 47, in 52 ton boats; Morris canal 101, in 25 ton boats.	South coal field.
Do.	182	Rail-road 9, by Black's eddy and Raritan canal 173.	Do. Anthracite.
Do.	215	Do. 9, Bristol 107, Raritan 99.	Do.
Nesquehoning,	178	Do. 5, Lehigh nav. 47, Dela. and Raritan 126, by Black's eddy in 200 tons barges.	Anthracite.
Do.	211	Rail-road 5, Lehigh nav. 47, Bristol 60, Dela. and Raritan 99.	Do.
Beaver Meadow mines,	193	Do. 26, by Black's eddy.	Do.
Do.	169	Do. 28, and by Morris canal 141.	Do.
Lycoming Creek mines,	323	Do. 25, Pa. can. 88, St. Cr. to Easton 109, Mor. canal 101.	Bituminous.
Port Lyon or Dauphin,	211	Proposed R. Rd. by Pt. Clint. to Allen. 94, Easton 16, do. 101.	Do.
Sinnemahoning mouth,	361	Sunbury 103, Port Lyon 48, by Morris canal 210.	Do.
Erie by Dauphin,	541	Rail-road to Sinnemahoning 180, to New York as above 361.	
Pittsburgh by Sunbury rail-road and Dauphin,	518	Do. do. 157, Dauphin 151, by do. 210.	Do.
Do. by Penna. canal,	490	Canals to Dauphin 280, to New York as above 210.	Do.
Do. via New York and Ohio canals,	1008	Canal 670, River 145, Lake 193, (lockage 1,877 feet.)	Do.
Cleveland, Ohio,	660	Buffalo 160, Albany 350, New York 150.	Do.
Do.	701	Via Pittsburgh and the Chesapeake and Ohio canal, &c.	Do.
Montezuma on the Erie canal,	368	By the Erie canal.	
Do.	370	By the Lehigh and Morris canals.	

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Localities of Coal Mining Stations.	Miles from the Mine.	Route Detailed.	Description of Coal.
To Tide Water		at New York.	
Montezuma on the Erie canal, - -	395	By Black's eddy outlet and Delaware and Raritan canal.	
Port Lyon or Dauphin, - - -	278	Havre 80, Philadelphia 80, New York 118.	
Black Spring Gap, - - - - -	185	Port Clinton 38, Easton 46, Morris canal 101.	Anthracite.
Lorberry Creek, - - - - -	177	Do. 30, 46 101.	Do.
Pottsville, - - - - - - -	166	Hamburg 19 46 101.	Do.
Do. - - - - - -	236	By Philadelphia, &c.	Do.
Nesquehoning or Room Run, - -	153	Rail-road 5, Lehigh 47, Morris canal 101.	Do.
Carbondale, - - - -	217	Do. 17, with 1,767 ft. rise and fall; Dela. and Hudson canal 108, with 1,076 ft. lockage in 30 ton boats, and the Hudson.	North region.
Wilkesbarre, - - - -	218	By Black's eddy.	Anthracite.
Do. - - - - - -	194	By Susquehanna and Lehigh rail-road 20, 73, 101.	Do.
Do. - - - - - - -	385	By Havre de Grace.	Do.
Do. - - - - - -	391	By Penna., Union and Schuylkill canals.	Do.
Whiteshaven, - - - -	232	Lehigh nav. 73, Dela. canal 60, Delaware 10, Raritan 89.	Do.
Towanda coal region, - - -	342	Rail-road 15, Penna. canal to Wilkesbarre 75, Rail-road 20, Lehigh navigation 73, Dela. canal 60, Dela. 10, Raritan 89.	Bituminous.
Do. by Morris canal, - - -	284	To Easton 183, Morris canal 101.	Do.

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STRUCTURE OF SHARP AND FOURTH MOUNTAIN RIDGES.

During the progress of the surveys in this district, between the Swatara and the Susquehanna, certain features in the configuration of the mountain crests, particularly of Sharp mountain, necessarily came under notice. By degrees we became familiar with these and other circumstances which facilitated or retarded the tracing of the coal seams; and it may be well to advert to them briefly in this note.

Contemporary investigators have observed that the crests of the Sharp mountain in no one instance correspond or maintain the same magnetic course on the opposite sides of the gaps. In numerous instances the line of bearing on the western side would, if prolonged a mile or two, either westward or eastward, nearly strike the southern base of the mountain, instead of ranging with the opposite ridge.

Hence the impression very naturally arose that this want of accordance in the crests extended itself to the stratification or interior structure of the whole mass. So far as our explorations have proceeded, they fail to corroborate this proposition; and in fact go to shew that no material horizontal displacement has taken place, other than ordinarily exists on the margins of fissures which the action of ages has widened into enormous ravines.

It used to be held that the southern margin of the coal field was occupied by one thick bed of conglomerate, ranging like a wall along the comb of Short mountain, and forming a compact barrier between the coal measures and the next lower formation. The explorations that later years have given rise to, shew that this mass is subdivided into many subordinate beds, each of which in turn becomes conspicuous. At the Panther head are five or six principal beds, from 15 to 120 feet thick. At Mount Eagle, Black Spring and Gold-mine Gaps the siliceous rocks appear to be contracted in breadth, or more probably, are less exposed: but one bed, placed nearly vertically, stretches along the crest, like a vast wall of ancient masonry, sometimes 40 or 50 feet in perpendicular height, and as many in breadth. At Yellow Springs are numerous beds of siliceous rock, having soft argillaceous strata alternating with them; and it is worthy of note, that conglomerate forms the roofs of all the coal seams discovered in that quarter, while the floors

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consist of shale. As in all or most of the gaps, there is here a sensible change in the direction of the strata in its opposite sides. This change must not be confounded with the apparent deflections which all strata not strictly vertical exhibit, when intersected by deep ravines.

Passing on to Rattling Run, there are sixteen or more distinct conglomerate beds seen in the gap, between each of which beds of rock, argillaceous and carbonaceous strata have been explored on each side. Here also a well proved deflection in the range of the strata, is seen in the drifts. While the Perseverance drift pursues a course N. 64½° E., the Reliance drift is N. 67° E., on the opposite side of the gap.

Whilst on this subject, we will enumerate the courses of such veins as have been worked in by a sufficient length of drift to ensure a correct observation.

Lorberry Creek, { Diamond vein, N. 68° E. on both sides the gap.
Peacock vein, N. 66° E. Panther Head.

Black Spring Gap and Gold-mine Gap, { Four Feet vein, N. 57° E.
Heister vein, do.
Grey vein and five others, do.

Rausch Gap.—The courses of the drifts are too near the margin of the gap to be relied on.

Yellow Springs Gap—Kugler vein, N. 65¼° E.

Rattling Run Gap, { Perseverance vein, N. 64½° E. } east side.
Mathews's Short drift, N. 68° E. }
Reliance drift, N. 67° E. west side.

The northern group of veins, so far as they have been examined, are not strictly parallel with the southern. In the "Narrow Valley," opposite Black Spring Gap, they pursue a course N. 52° E., being five degrees out of parallel with the southern veins, and as much as ten degrees diverging from the Fourth mountain itself. This discrepancy, in the latter case, is so common an occurrence, that we shall endeavour to explain it; because facts like these, apparently trivial, are often of material importance to those engaged in mineral investigations. In following the course of either or both the mountain crests, it is observable that the crowning beds of conglomerate are seldom prolonged to considerable distances; but seem to shift either to the north or south side of the crests. In other words, the crests appear to, and in fact do, range obliquely across these hard rocks. Thus, for a space, one of the central series is

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prominent, forming the "backbone" of the mountain: as we proceed, this stratum, which heretofore stretched like a wall along the ridge, subsides, and is lost beneath the surface; another hard vertical stratum gradually becomes the prominent one, and this, in its turn, is superseded by another, and so on: the bearing of the crest changes, but the prevailing elevation of the mountain continues with singular regularity. In the Pinegrove district, and thence to the extreme western termination of the coal region, this character prevails. Sometimes one puddingstone bed attains the pre-eminence and forms the crest; and again another supersedes it, giving to the outline a change of direction, unconformable, for a while, to that of the strata.

This character is displayed on a large scale at Rattling Run Gap, where the series of Puddingstone rocks which form the crest on the east side of the gap, is from 500 to 700 feet north of the group that constitutes the western ridge. This feature is illustrated by our transverse section, Fig. 2, Plate No. 147, where a perspective elevation or profile of the two crests of Third mountain is traced. Westward from this gap are four main beds of hard rock, each of which in succession predominates southwardly—No. 1 giving place in altitude to 2, and 2 to 3, and 3 to 4, until they reach the Big Flats, when the reverse operation takes place, and they gradually rise in succession northward, No. 4 yielding precedence to 3, 3 to 2 and 2 to 1, which thence continues to maintain the highest elevation, until it crops out or thins off westward; and so in succession do the remaining three, near the Six mile openings, beyond which they no longer exist in the coal region.

There was good reason for giving to our Third mountain the characteristic name of *Sharp* mountain. During the whole length which has come under consideration in these pages, we find this epithet of Sharp, particularly descriptive. It seldom exceeds ten rods wide, and is often not so many feet, at the crest. The Fourth mountain, on the contrary, rarely shews a sharp ridge. Its summit, although superficially much broken, is more commonly than otherwise a rounded flat, of from twenty to fifty rods in breadth.

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REPORT

OF THE

GEOLOGICAL EXAMINATIONS,

THE

PRESENT CONDITION AND PROSPECTS

OF THE

STONY CREEK COAL ESTATE,

IN THE

TOWNSHIPS OF JACKSON, RUSH, AND MIDDLE PAXTANG,

IN THE

COUNTY OF DAUPHIN,

AND OF

EAST HANOVER TOWNSHIP,

IN THE

COUNTY OF LEBANON,

PENNSYLVANIA.

BY RICHARD COWLING TAYLOR,

PHILADELPHIA.

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INTRODUCTORY NOTICE.

In the foregoing Report of the prospects, resources, land and mineral property of the Dauphin and Susquehanna Coal Company, we have been frequently led to the consideration of circumstances common to that and to the Stony Creek Coal Estate. We were consequently induced to extend that report by assembling together a great mass of details equally referring to both properties, rather than to dilute and spread those materials over two reports. Hence, it will be inexpedient to travel over much of that ground anew. Whatever, therefore, may be deficient in the following article, we trust may be supplied in the previous report, or be found in the Appendix, in full illustration of all matters connected with this subject.

AREA OF THE STONY CREEK COAL ESTATE.

A schedule of the lands comprising this property, distinguishing the number, warrantee names, quantity, county and township of each tract, will be found in the Appendix A; and the same is also illustrated in the large map, No. 138, which accompanies this report.

The main body of this estate, including some intervening tracts, may be stated as five or six miles broad, and ten or twelve miles long; extending from the

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summit of the Second mountain to the base of Berry's mountain, and comprising Second mountain, Stony Creek and Evening Creek Valleys, Third or Sharp mountain, the Coal Valley, Fourth mountain,* part of Clark's Valley, Peters' mountain, and the Short mountain of Jackson township. Another portion extends westward along the north slope of the Short mountain in Rush and Middle Paxtang townships to within one mile of the Susquehanna.

The superficial character of the area under consideration, containing upwards of thirty thousand acres, as may readily be inferred from the preceding sketch, is mountainous. It is naturally divisible into three portions: the northern tracts, the southern, and the western tracts; and as such we shall occasionally advert to them.

The entire area comprehended in this estate, consists of eighty-seven tracts or pieces; comprising therein thirty thousand two hundred and sixty-eight acres and eighty-four perches, exclusive of the legal allowance of six per cent. for roads, which allowance amounts to one thousand eight hundred and sixteen acres and sixteen perches. Altogether, thirty-two thousand and eighty-four acres and one hundred perches.

Of this amount six pieces, containing two hundred and ninety-seven acres and forty perches, comprehend the mining privileges only, and not the land itself.

For the sake therefore of convenient description, we divide the estate as follows:

* The Third and Fourth mountains, with the intermediate coal flat or valley, originate in and are expansions of Short mountain. We adhere to the names by which the mountains are recognised in the district under examination.

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	Exclusive of 6 per cent. allowance. Acres.	Rods.	Including the usual allowance. Acres.	Rods.
32 Northern Tracts or pieces,	11,961	98	12,679	100
39 Southern do.	15,464	41	16,393	00
16 Western do.	2,842	105	3,012	00
Total, 87	30,268	84	32,084	100

THE NORTHERN TRACTS,

Consisting of 32 tracts or pieces, and containing 11,961 acres and 98 perches—or including the allowance of six per cent. for roads, 12,679 acres and 100 perches.

A topographical survey and report was made to the proprietors in 1831, by Messrs. Davies and Young, chiefly with reference to the quality of the land and the state of the timber. They and others, both before and since, speak of coal here, and one reporter has even estimated the number of tons therein at twenty-six millions.

The examinations of the present writer, however, lead him to a different conclusion, and shew that the whole of this area is out of the true coal region. So far, therefore, as regards their mineral value, we are brought to the opinion that no workable beds of coal exist here. This is to be regretted, because at an early day our predecessors were led to attach great importance to this area, on account of the abundance of coal said to prevail herein.

In some degree, it makes up in agricultural what it lacks in mineral value. It is, in this respect, the best part of the estate. Most of the northern tracts are unincumbered with surface stones, and though occa-

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sionally poor and elevated at least 1,200 feet above the sea, are not unadapted to farming purposes.

The timber on the high table land, which also bears the name of Short mountain, is chiefly yellow pine, with white and black oaks and chestnuts in the ravines, estimated at from fifteen to forty cords per acre.

The southern parts of this division, particularly along the branches of Powell's Creek, consist of good red shale soil. The timber in some places is fine and valuable, averaging from thirty to forty cords per acre; but this part of the estate has been too frequently plundered by squatters and wood stealers, and claimants of one description or another.

Peters' Mountain forms a part of this district, being a long narrow ridge. Its soil is poor and rocky. The timber thereon is estimated at twenty-five cords to the acre. Here also, it has been constantly maintained, veins of coal crop out the whole way along each side of its summit. It is not altogether improbable, that although out of the true coal field, a small seam of imperfect coal may exist, as in fact was shewn to be the case by J. Weiss, many years ago. The same veins of spurious coal extend to and across the Susquehanna, where some labour has lately been expended in endeavouring to mine it, near the Duncannon iron works.

THE WESTERN TRACTS.

Sixteen tracts or pieces, containing 2,842 acres and 105 perches, exclusive of the allowance for roads, or 3,012 acres including the same.

These are of small value for agricultural purposes,

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being on the steep, rocky, northern slope of the Short mountain. They possess, however, some importance as timber land, particularly in approaching the west, where it is among the most valuable on this estate.

This area includes upwards of two miles in length of the extreme western portion of the coal field. The remaining tracts skirt the north side of Short mountain, and the Coal Company have reserved the right of access to open the outcrops of their veins from that side, should it be found expedient.

THE THIRTY-NINE SOUTHERN TRACTS.

This area contains 15,464 acres and 41 perches, exclusive of six per cent. allowance for roads, or 16,393 acres including the allowance.

Its boundary has been sufficiently defined; and we need not premise that it forms the most valuable part of the whole Stony Creek estate.

The surface value of the soil is as variable as the irregularities of the ground would indicate; but its predominant character is extremely rocky, and particularly on *Sharp Mountain*, whose entire slope, down to Stony Creek, presents a chaotic wilderness of large subsided masses. A great quantity of excellent timber prevails upon this property, especially in the flats and moist places, where the fires have not overrun so frequently as upon the dry ridges. The most accessible portion is along the mountain coal flats and valley, between its two rocky barriers. It would add much to the value of the estate if a road were made here to join that which has already been completed for sixteen miles along the Coal Company's property,

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westward. A continuous road along the valley between the Second and Third mountains, is also greatly needed to open the resources of both estates.

Second Mountain is somewhat less rocky on its surface than Third mountain, and on a considerable portion of the slope towards Stony Creek is a fine growth of chestnuts, white oaks, poplars, white and yellow pines, black oaks and hemlock.

Stony Creek Valley is in some parts rocky and contracted; in others swampy, owing to the want of proper drainage. From the Cold or Virtuous Spring, upwards, to the head of Stony Creek, is a good breadth of bottom land, particularly at the Big Swamp or Clarke's Swamp, admirably adapted for pasturage, and where, even before the lands were taken up, the cattle from the neighbouring districts were annually sent and tended.

Near the centre of the estate is the summit of this valley, where the waters descend in opposite directions. Mr. Miller reports the distance to Dauphin as 21¼ miles, and the fall 536.23 feet; being 538 feet to the Pennsylvania canal, and 865 feet above tide. Col. Aycrigg's preliminary survey from the same point at the summit level eastward, shews the distance to the reservoir of the Union canal feeder, at Port Mifflin, to be 7$\frac{7}{10}$ miles, with a descent of 431½ feet, being an average fall of 55.9 feet per mile.

The Coal Formation, comprised in this division, exhibiting separate groups of coal veins in the Third and Fourth mountains, we shall specify under its separate head.

Mount Eagle is near the eastern extremity of the

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estate, on which the proprietors have built one large and one small dwelling house.

Fourth Mountain. The summit or crest of this ridge, according to a late decision, forms the boundary between the counties of Dauphin and Lebanon. It is very rocky, and covered with loose fragments, particularly down its north slope, which has not yet been explored for mineral strata.

Coal Landing at Port Mifflin. A piece of land purchased for this purpose, is situated at the mouth of Fishing Creek, and at the junction of the Fishing Creek rail-road with the Union canal reservoir, which is here 459.86 feet above tide.

THE COAL BASIN GENERALLY.*

The separate portions will be described in detail; but we shall previously take a general view of the district in which this property is situated. We would avoid all technicalities, so far as such a report admits; aiming to give it a commercial or economic, rather than a scientific value, and to impart to it a suitable business character.

In the foregoing Report to the Coal Company, cer-

* There are obvious objections to the employment of the word "coal basin," as has been customary of late, to those coal areas which happen to be drained by separate streams. It is neither geologically correct nor practically applicable. It introduces erroneous impressions; because it has reference to superficial or topographical contour, instead of to the arrangement of the coal formation. Upon this principle there are eight coal basins between the Susquehanna and Fishing Creek; yet under the operations of the miner they will, hereafter, be as effectually one, as they are now geologically one.

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tain prevailing features of this coal formation have been adverted to, and need not here be repeated. As was stated in the introductory remarks, the examination commenced from the east, in order thereby to obtain a clue to details which are less apparent further westward. Before proceeding further, it may be useful to notice the appearance of the coal seams at points where they are intersected by different branches of the Swatara, so far as they tend to elucidate the Stony Creek coal district. This description is greatly abbreviated from the original notes; since in the interval a Report on the Swatara Mining District has been printed by the legislature of Pennsylvania, and its details may be consulted to advantage.

Coal Veins in the Swatara District corresponding with the South or Sharp Mountain Group of Stony Creek.

Swatara Gap in Sharp mountain. The coal formation is deeply cut through, and the outcrops of several veins are visible where they cross the gap. Hitherto we understand no coal has been worked here, nor have drifts been opened.

East Rausch Creek Gap. Two or three veins have been proved here, and as many more outcrops are known, but none have been worked. This gap was found to be 777 feet above tide, by Col. Aycrigg.

Lorberry Creek Gap. The diagram of Sharp mountain* shews five veins, of which one of eight feet and another of three feet are worked, and one other of nine feet is opened; several others have not been proved. Their course is from N. 67° E. to N. 68° E.

* Report of Swatara Mining District, p. 16, diagram No. 2.

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The lowest coal drift at present open (the Peacock vein) is 842.8 feet above tide.

Fishing Creek Gap. For want of roads opening into this valley no coal has been proved on either side the mountain. The level of the first coal in this gap of Sharp mountain, was found by Col. Aycrigg to be 846.8 feet above tide.

Coal Veins corresponding with the Fourth Mountain Group.

East Rausch Creek. At the gap in the Fourth, here locally called the Red mountain, and sometimes Broad mountain, four or five veins have been opened, but not worked. The lowest of these is 1,159 feet above tide.

Lorberry Creek. In a corresponding gap, according to the same report,* seven veins have been opened here. Their united thickness were ascertained to be 74 feet; including the Mammoth vein, 30 feet thick, of which 12 feet only are worked. The level of the drift on this vein is 1,126 feet above tide. After leaving the forks of Lorberry Creek, there is no other depression or gap in Fourth mountain to its termination near the Susquehanna.

Immediately on passing this series northward, we enter another, which may be denominated the Coal Mountain Group, containing several good veins. No part of this group appears to extend so far west as the county line. It is an additional mass which has wedged in from the west, like the other masses or groups of carboniferous strata, and has gradually widened the coal region as it approaches the Swatara.†

* Report of Swatara Mining District, p. 19, diagram 3.

† The numerous ramifications of this stream within the coal

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Lorberry Creek.

	Miles.
Distance to Havre de Grace	120, by Union, Penna. and Tide Water canals.
Do.	111, by Stony Creek R. Rd. & Pa. & Tide canals.
Do. by Fishing Creek Gap	117, by Tide Water.
Do.	121½, by Good Spring Creek, Un., Pa. & T. cans.
Philadelphia	139, Union and Schuylkill canals.
Do.	136, Fishing Cr. Gap R. Rd. & Un. & Sch. cans.

The three collieries on Lorberry Creek, are "the only ones in the Swatara mining district." The *Mammoth vein*, which has from 20 to 24 feet of coal, of which 12 to 14 feet are worked, affords the following analysis of its coal, in the best part.

Carbon, ...	85.9 per cent.
Volatile matter, . .	7.2
Ashes, ...	6.9

Specific gravity, 1.472; weight per cubic yard, 1 ton 244 lbs.

We are informed that the expenses of mining this vein, (in 1838–9,) are as follows:

Mining, per ton, coarse coal, . .	65 cents.
Hauling it out and loading, men and teams about $14 a day; the average quantity brought out is 36 tons per day, ...	35 cts. per ton.
Cost on the bank, . .	1.00 „

region, impart a peculiar local character to the district. They indicate geological phenomena of an interesting nature; and mark a position which seems to have been particularly influenced by disturbing forces; such indeed as we should expect to find at the point of bifurcation or separation from the main body of the two western forks of the great coal basin. The twenty-nine mountain gaps, through which these tributaries pass, afford to the miner facilities for working out an enormous amount of coal; and exemplify, (as was noticed in a previous page,) the general southern drainage of the entire basin, through ancient lines of fracture which crossed the strata at right angles. Further—they exhibit another feature, not uncommon, of a double system of valleys, having very different dates and origin.

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Cost on the bank brought forward,	$1.00	per ton.
Cost extra to bring it down the inclined plane,	25	
Thence by rail-road to canal at Pinegrove,	35	
Small expenses and contingencies, . . .	15	
Cost at the wharf, . .	$1. 75	„
Usual price sold at the wharf, $2.50. Profit,	75	„

From this mine, which furnishes the principal supply of coal at present, there is a descent of 636 feet to the canal basin at Pinegrove; the distance being $5\frac{7}{10}$ miles. By the proposed rail-road down Fishing Creek Gap the distance is $7\frac{7}{10}$ miles, and the fall is $666\frac{1}{2}$ feet.

The next mining concern of importance, is in the *Peacock vein*, eight feet thick; originally only four feet, but in one place was 15 feet thick. The fall from the opening on this vein to the canal at Pinegrove, is 352.5 feet, and the distance by the rail-road is $4\frac{9}{10}$ miles. It is now in good working condition, having been strongly timbered at a heavy expense. No blasting is required in this vein, the coal being dislodged by "undermining," and is of excellent quality.

Cost of mining coarse coal, the small not being paid for, ...	75 cts.	per ton.
Expenses of transportation, &c. by rail-road to the Pinegrove basin, ...	75	„
Cost at the wharf, coarse coal,	$1.50	„

The price of almost any coal at the wharf at Pinegrove, is about $2.50 per ton.

The proprietors generally look for a profit of from 75 cents to a dollar per ton.

The Peacock vein produces a valuable free burning red ash anthracite. Colour, jet black; lustrous; fracture largely conchoidal, splitting longitudinally. This

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is considered to be identical with the vein of the same name on the Stony Creek estate.

The *Grey vein*, (sometimes called the Furnace vein,) nine feet thick, of which four feet comprises the best coal, is evidently the same as the 14 feet Grey vein of Lebanon county; distinguishable by a peculiar seam of closely granular, fibrous, coke-like grey coal in the centre of the vein—has not been extensively worked, being hitherto soft, dry and inferior to that on the Stony Creek estate.

The *Diamond vein* is only three feet thick, of good but very hard coal, only to be disengaged by blastings; in structure it is irregularly conchoidal, much finer in the fracture than the Peacock vein. It will probably be a more expensive vein to work.

As a general rule, observed by those interested in the mining establishments of Lorberry Creek, all the veins are larger and more permanent on the west than on the east side.

Fishing Creek Gap. No coal veins opened. It is the deepest gap in the Sharp mountain west of the Swatara region, being 846.8 feet above tide.

COAL FORMATION OF THE STONY CREEK ESTATE.

At the Schuylkill county line the breadth of the region, from red shale to red shale, is about 1½ miles. At Rausch Gap, five miles to the west, it is perhaps not far short of the same breadth. There is probably little alteration even so far as Yellow Springs, where it is about 1¼ miles wide, and nearly the same at Rattling Gap. The boundary of the formation, particularly along the rocky north side of the Fourth mountain, has not been investigated very closely.

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For a long period to come the working of the coal on this property can be effected by means of drifting from the ordinary water levels in the gaps, by which breasts can be obtained, varying, in perpendicular height, from 100 to 600 feet. This mode can afterwards be extended by continuing on those drifts which commence in the deepest ravines, and carrying on the levels as far as the limits of the property extend, longitudinally. By this process the whole of the Sharp mountain coal can be mined, which lies at from 1,000 to 1,060 feet in elevation above tide; the prevailing height of the mountains being upwards of 1,600 feet above tide. If any of the southern veins prove to be workable, they can be entered at 200 feet lower, in certain positions.*

By recent explorations towards the eastern part of this property, fifteen veins were proved, whose aggregate thickness is 90 feet 10 inches; of which number, eleven are the best and easiest worked, and average seven feet each. In describing these, and in briefly detailing the explorations we have been carrying on, we propose to review each group separately, as we have done with regard to the coal beds within the Pinegrove district, commencing with the southern group.

* The high elevation which the coal beds attain is a circumstance common to all our depositories of this mineral in central Pennsylvania. For instance, Mauch Chunk and Nesquehoning in the first coal field; Beaver Meadow, Hazelton, Mahanoy, and various collieries in the middle region; Carbondale in the Wyoming region; and the whole range of the Alleghany bituminous region, from Tioga and Bradford to Virginia. Pottsville, Tamaqua, and the neighbouring district, Bear Gap in Lyken's Valley, and some positions in Wyoming Valley region, are favourable exceptions. The coal of Broad Top mountain is probably workable at about the same elevation as the Stony Creek veins. These facts are more particularly illustrated in the diagram No. 145, appended to this report.

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SOUTHERN OR SHARP MOUNTAIN GROUP OF COAL SEAMS.

Mount Eagle and Black Spring Gap Section.—Vide Pl. No. 147, Fig. 6.

26½ miles from Port Lyon, and 4½ miles from Port Mifflin, at the Union canal reservoir.

Although the principal coal veins were opened here by the former owners, some twelve or thirteen years ago, they were found so obscured by the lapse of time, that it became necessary to entirely re-examine the ground in 1838 and 1839. Accordingly, the old drifts were re-opened and restored; twenty-five new shafts were sunk; and some new veins were discovered. The result of these explorations exhibits eight veins of anthracite, having a total thickness of 54⅓ feet, and an average of 6¾ feet to each vein: the details of which are as follows:

TABLE I.

	Spaces in Feet.	Total of Thickness. Feet.	Thickness of each Vein of Coal.	REMARKS.
Commencing at the Vertical Wall of Conglomerate, fifty feet thick, forming the Backbone of the Ridge of Sharp Mountain—				The strata nearest the ridge are a little inclining south.
To traces of a Southern Vein, said to be 3 feet,	70	70	—	Course N. 57° E.
1. To Coal Drift on 4 feet Vein,	100	170	4.	Length of Drift, 275 feet.
2. Vein next the Iron Ore bed, 3½ to 4 feet, supposed to be the Pitch Vein,	73	243	3.	East of Gap, excellent Coal.
Bed of rich Iron Ore, 2 feet thick, adjoining,	—	—	—	Do. Cross cut, 38 feet.
3. Peacock Vein; very good Coal; 6 to 8 feet elsewhere, with 6 inches of iron ore in the bottom, slate,	30	273	4.4	Do. New Drift, 117 feet.
4. Black Spring Vein,	124	397	6.	Do.
5. Mount Eagle Vein,	74	471	5.4	Do.
6. Three Feet Vein, north of Big House,	250	721	3.0	West side the Gap.
7. Heister Vein, vertical,	100	821	10.7	Drift 1003 ft. long, N. 57° E.
8. Grey Vein, vertical, N. 57° E.	100	921	14.1	Drift 590 feet long.
Central space in the Valley without Coal: no regular strata were reached in any shaft here,	2100	3021	—	Apparently disturbed.
			50.4	Total proved.

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Elevation of No. 1 drift above Rausch Gap,	100 to 130 feet.
Elevation above Union canal reservoir,	713
„ Pennsylvania canal at Port Lyon,	845
„ Tide Water,	1,172

	Miles.	
Distance to tide at Havre de Grace,	106,	by Stony Cr. rail-road and canals.
Do. Evening Cr. R. Rd. 4½ miles,	114,	by Union canal route to Havre.
Do. to Phila. with R. Rd. 4½ m.	133,	by Union and Schuylkill canals.
Do. do. with rail-road 26 miles,	185,	by St. Cr. & Sch. can. or by Havre.
Do. Balt. by Stony Creek route,	160.	
by Union canal route,	168.	

The No. 1, *or Four Feet Vein*, has a breast of three or four hundred feet, and has been occasionally worked during the last ten years, the coal being an excellent free burning quality of anthracite, much resembling the Lyken's Valley or Bear Gap coal. The drift is 275 feet long.

The *Peacock Vein* was opened midway between the two gaps, and has been stated to be from 6 to 8½ feet thick there, but smaller near Mount Eagle.

Analysis.	Carbon, . . .	88.60
	Volatile matter, . .	7.10
	Ashes, . . .	4.30
		100.00

Specific gravity, 1.528; weight per cubic yard, 1 ton 338 lbs.

The *Heister Vein*, 10$\frac{7}{10}$ feet thick, has a breast of about 250 feet; the drift being 753 feet above the lower reservoir of the Union canal. The drift, which is newly timbered, is above a thousand feet long. A part of this vein is of excellent quality; and another is laminated and occasionally "bony." In advancing west it appears to loose this quality, and is all sound and good at Gold-mine Gap.

The *Grey Vein* contains some splendid coal. Its entire thickness is 16$\frac{7}{10}$ feet, of which 14$\frac{1}{10}$ feet are pure coal. This vein is remarkable for containing

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near its centre two or three feet of a greyish coal, having a fibrous texture, somewhat like the best coke or charcoal. This quality is very suitable for some practical purposes. In burning it gives out a white and yellowish flame, rapidly increasing by a current of air, or by being blown upon, and leaves a red ash.

Analysis.	Carbon,	86.00
	Volatile matter,	4.50
	Ashes,	9.50

This vein has a drift into it 590 feet long. All the coal that is above the present level can be worked out at a very cheap rate.

Two experiments to ascertain the weight of this coal gave

First—Specific gravity,	1.379
Second, do.	1.395

The mean of which shews that one cubic yard weighs one ton and one hundred pounds.

Iron Ore of this group. In the shales on the north side of the Coal Vein No. 2, at Mount Eagle, is a course of balls of rich argillaceous carbonate of iron; also one seam of six inches, and another of nine inches thick; another seam of six inches occurs with the next coal vein, the Peacock, all of which can be worked out with the coal vein. The analysis of this ore gives

Oxide of Iron,	71.0	
Oxide of Manganese,	9.5	
Silica,	5.0	
Alumina,	14.5	
Metallic Iron per cent.,		49.23
Metallic Manganese,		6.58

The large amount of manganese in this ore is characteristic. There is probably little ore of this description without some traces of that mineral. In France

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we observe the oxide of manganese is quoted at 5 to 6½ per cent. in ores of this kind. We perceive that a patent has lately been obtained in England for the employment of manganese in the process of converting cast into malleable iron, and in improving the quality of *cast steel.* It seems, however, that it has been known and used for these purposes, in England, more than thirty years. In Scotland, manganese has been employed not only in the puddling process, but in the blast furnace and the running out fires.

Two miles from this part of the property, in Fishing Creek Gap, is the Swatara furnace, of Messrs. Guilford & Eckert. This is used with the hot blast and produces about twelve hundred tons of iron annually. The ore is partly the brown hæmatite from Chestnut Hill near Columbia, brought seventy miles, and partly from near Lebanon, about thirty-two miles.

Gold-mine Gap.—Vide Plate No. 147, Fig. 5.

25 miles from the Susquehanna; 6½ from the Union canal reservoir at Port Mifflin; 105 from Havre de Grace by Stony Creek; 115 to Havre de Grace by the Union canal; 134½ from Philadelphia by Union and Schuylkill canals; 169 from Baltimore by Union canal route; 159 from Baltimore by Stony Creek route.

Elevation of the Peacock vein drift 870 feet above Pennsylvania canal, 737 feet above Union canal at Port Mifflin, 1197 feet above tide; but the veins could be opened from 100 to 150 feet lower, which would assist the working of the Black Spring Gap veins.

Here are four drifts, besides many old shafts, east of the gap, proving the principal veins seen at Black Spring. The section, so far as is proved, is the following:

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TABLE II.

Details of Coal Veins.	Spaces in feet.	Total thickness.	Thickness of Coal.	Remarks.
Vertical Wall of Puddingstone 50 feet thick.				
Crop of coal and smut, - - - - -	129	129	—	Not proved.
Second crop, - - - - - - - - -	90	219	—	Not proved.
1. Four feet Coal Vein, 1197 feet above tide, - - - - - - - - - -	60	279	4.0	Largely conchoidal.
3. Peacock Vein, from 2 to 7 feet thick,	160	439	4.6	Course N. 57° E. Drift 112 feet.
6. Three feet Vein at Old Shanty,	429	868	3.0	
7. Heister Vein, - - - - - - - -	109	977	9.0	Good Coal.
8. Grey Vein, 10 or 12 feet, - - - -	120	1091	12.	
Vein not drifted on, - - - - - -	111	1208	—	Unproved.

Several veins seen to the east and west have not yet been opened here. The *Peacock vein*, analysis of 100 parts,

Carbon, ...	83.00
Volatile matter, . . .	9.00
Ashes, ...	8.00

Note.—The coal obtained from this vein for the purposes of the analysis, had been brought out of the old drift twelve years ago, and consequently after so long exposure to the air, it would scarcely be a fair representation of its true quality.

Rausch Gap.—Vide Plate No. 147, Fig. 4.

21 miles from Port Lyon or Dauphin. 10 miles to Port Mifflin.
101 do. to Havre de Grace by Stony Creek route.
108 do. do. over Second mountain to Union canal.
119 do. do. by Union and Tide canal route.
99 do. do. by Indiantown Gap and do.
138½ do. to Philadelphia by Union and Schuylkill canals.
126 do. do. by Indian Gap and do.
137 do. do. by Stony Creek and Lancaster rail-road.
180 do. do. by do. and by Havre and Delaware.
173 do. to Baltimore by Union canal route.
155 do. do. by Stony Creek route.

Elevation above	Pennsylvania canal, . .	720 feet.
,,	the Big Dam or reservoir, .	613
,,	Stony Creek about . .	230
,,	Tide at Havre, . .	1,047

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The excavations made here several years since, shew that some good coal seams were discovered. We were, however, uninformed of the true character of the coal, and of many important circumstances relating to the veins.

Of late a small mining force has been employed, which has already opened four new drifts into as many veins, whose united thickness is about 30 feet. Other examinations are in progress; and from the data collected from the former explorers, we are enabled to prepare the following section.

TABLE III.

Description of Strata.	Spaces in feet.	Total feet.	Thickness of Coal.	Remarks.
Commence at the Central Conglomerate.				
Softer Strata,	18			Near the breast of the mountain.
1. *First Pitch Vein*, opened on the east side of the Gap,		18	2	6 feet seam, shewing 2.1 of good coal.
Soft and mixed strata,	90	108		
Puddingstone, 30 feet thick,	30	138		
Softer beds,	12	150		
2. *Second Pitch Vein*, or Bill's Vein, opened on the west side,			3	With rich balls of iron ore.
Soft Rock and Coal Shale,	38	188		
Puddingstone,	40	228		
Coal measures, soft beds,	10	238		
3. *Coal*, Dan's Vein, opened on the west side,			3	With balls of good ore.
Soft Coal measures, shales,	30	268		
Coal Smut, probably a very thin vein,				
Hard Sandstone,	13	281		
Soft Coal measures,	37	318		
4. Coal Vein, 2 to 4 feet,			2	With good balls of iron ore.
5. Windlass Vein, many openings on both sides,	82	400	4	Good Coal.
6. Four Feet Vein,	128	528	4	New drift, with iron ore balls.
7. Seven Feet Vein, Coal 6 or 7 feet, 12 or 15 feet, with 6 feet of slate,	95	623	6	New drift, at present 6 feet of Coal.
8. Heister Vein, called 10 feet Vein, 50 feet drift,	115	738	6	New drift, with iron ore.
9. Grey Vein, 50 feet drift,	100	838	10	New drift.
10. Crop of a small Vein,	100	938		Not proved.
Coal Slate,	57	995		Not proved.
			40	Total thickness.

Contrary to expectation, we have found the coal of

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such of the Rausch Gap veins as are in a state for examination, to partake of the slightly bituminous character observable in the coals of Yellow Springs, or rather that they form a transition variety between them and the Pinegrove coals. They may be said to form the termination of the non-adhesive, open burning class of *dry coals* and the commencement of the true *anthracites*.

The *Pitch vein*, No. 1. Analysis of coal.

Carbon,	78.90
Volatile matter,	11.00
Ashes,	10.10

The *Heister vein*. Analysis of coal.

Carbon,	77.10
Volatile matter,	10.90
Ashes,	12.00

Specific gravity, 1.387; weight of a cubic yard, 1 ton 100 lbs.

These specimens had laid out many years, exposed to the atmosphere; and their analysis must be viewed with that understanding.

A specimen lately procured from the new drift into this vein, shews the specific gravity 1.454, being one ton and two hundred and thirteen pounds per cubic yard. This has been called a 10 feet vein; but the new drift only extends 50 feet, in a central bed of good hard coal 4½ feet thick. We have not, therefore, proved the true size of this vein.

The Grey Vein. At the end of the new drift, only 50 feet long, this measures nine feet six inches of coal, too near the outcrop to be very compact. The old workings proved this to be a ten feet vein.

The Seven Feet Vein. So proved in the old shafts. The recent drift extends 79 feet, in a bed only four feet seven inches—which is probably one out of the two seams formerly proved to belong to this vein.

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Peacock Vein. An excellent vein of good coal. The drift being at present only 30 feet under, shews only three feet thick. From its position and the large conchoidal fracture it exhibits, it is supposed to be a continuation of the vein of that name at Mount Eagle. It burns with a yellow flame for awhile, denoting the presence of bitumen.

Iron Ore. We have, no doubt, even with our present limited information, that as much of the argillaceous carbonate of iron can be obtained and mined with the coal veins here, as would permanently supply a blast furnace. We already know that at least five coal veins are accompanied by balls and seams of this ore, in the gap—besides one bed which adjoins a coal vein on the foot of the North mountain. The quality of the Rausch Gap ore is excellent.

From the character of the shales accompanying the coal veins between this place and Gold-mine Gap, it is probable they will be found to contain strata of argillaceous iron ore, and will ultimately well repay the cost of examination. It is also probable that these ore beds can be worked out with the coal, by a very economical process.

In the progress of the practical exploration of this coal district, we confidently look to the discovery of other beds of the clay iron ore. On the borders of Rausch Creek in the Swatara district, ore of this quality is worked for the supply of a furnace at Pinegrove.

Remarks on Rausch Gap as a Colliery Station.

This situation we regard as the best on the property for affording access to the fine group of coal beds we

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have briefly noted, at a comparatively low water level, without the aid of machinery or steam. The present drifts on the three northern veins of the series, are rather lower than that assigned to work the Perseverance vein at Rattling Gap. All south of these can be worked many feet lower, as the descent is very rapid in the gap. There can be probably obtained from 300 to 600 feet breast here. Water power too is close at hand at several points along the ravine of Rausch Creek, which is the main tributary to Stony Creek; and there is a great deal of good timber in the vicinity. Of pit timber the supply, we might say, is inexhaustible. No examination for veins south of the "backbone ridge" of Sharp mountain, has taken place hereabouts.

Its central position affords it the choice of two routes to tide water, either at Havre de Grace and thence to Baltimore or Philadelphia. To the former, it is nearer than any coal station in Pennsylvania; with the exception of the Dauphin and Susquehanna Coal Company's lands: to the latter, it is also nearer than any other, excepting the Pottsville district.

Apparently all the coal seams constituting the southern group, can be worked upwards of two miles from Rausch Gap westward, to the boundary, opposite to Cold Spring. We have adverted (p. 20) to the explorations lately made there. They shewed that the strata continued uninterruptedly along the summit flat between the two mountains. One of the veins proved here in a shaft was about six feet thick, enlarging downwards. From all we observed we were led also to infer that the coal strata of this area possess a more permanent character than in some positions elsewhere. The greater abundance of carbonate of iron

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interstratified with the coal seams, and the scarcity of bog ore in the springs, appear also to have reference to this fact.

Timber. We have adverted to this subject in various parts of this report.

For the purposes of pit wood, there is a supply beyond what is ever likely to be required for the working and propping of the mines.

Fire Clay is obtainable in the vicinity of several of the coal veins.

NORTHERN OR FOURTH MOUNTAIN GROUP OF COAL SEAMS.

Strata opposite Mount Eagle.

We have stated that there is an interval between the north and south group or series of two thousand one hundred feet, wherein no coal has yet been met with. This circumstance accords with all we have observed, both to the east and west. As regards mineral strata, it is probably barren ground, composed to a great depth of broken materials, amongst which the mountain streams have their deepest sources. In a suite of several trial shafts, sunk towards the centre of this upland valley, no other materials were observed but gravel, washed clay, and quicksands. A similar transverse suite, fifteen miles westward, afforded the like unsuccessful results.

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TABLE IV.

Section of Fourth Mountain.	Spaces in feet.	Total thickness.	Thickness of Coal.	Remarks.
Central Flat, apparently without Coal,		3021		Measured fm. Sharp Mountain.
1. The Fishback Vein, 8 feet 3 inches at 28 feet deep, 11 to 12 feet proved by Dr. Kugler,		3021	11.0	Course N. 52° E. Dip to S. 70°.
2. Carey Vein,	72	3093	5.6	Shaft at 37 feet deep.
3. Slaty Vein,	68	3161	4.0	Course N. 52° E.
4. Lea Vein, at 28 feet deep,	157	3318	7.0	Dip 75° to S. bottom slate 70°, top slate.
Bed of Iron ore balls,	159	3477		Course N. 52° E.
5. Five feet Coal Vein, at S. foot of North or 4th Mountain—a second crop appears very near to this,	8	3485	5.0	In shaft at 24 feet deep.
6. Crop of a small Vein, 5 or 6 inches only yet,	66	3551	.6	In the Stone Tunnel.
7. The Tunnel Vein,	74	3625	3.6	In do. Dip 70° to S.
Conglomerate series to South edge of the mountain,	60	3685		Summit of Fourth Mountain unexamined.
Central ridge of conglomerate, 50 feet thick,	350	4035		
North edge of the mountain,	450	4485		
A series of strata belonging to the Coal formation, its thickness not determined,	- -	- -		North slope of Fourth Mountain.
Total thickness,	- -	- -	36.6	At present proved.

The *Fishback Vein* is estimated at 11 to 12 feet thick, and is considered the best in the mountain. There are several old shafts upon this and the three adjoining veins. These are about 300 feet above Black Spring Gap, and the summit of the Fourth mountain is probably 200 feet more. The form of the ground is not very favourable for the opening of drifts into them, and a main adit would be of great length if a breast were to be worked on that plan. However, it will be long ere it be required to operate upon these beds.

The coal of the Fishback vein has a dark leaden hue, but becomes more black, and also more compact, in descending deeper. In burning it appears to give out more whitish flame than is usual with the anthracites. Colour of the ashes of this and most of the

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other veins, reddish-grey.—Analysis from the specimens in the trial shaft at 28 feet deep:

Carbon,	84.00	
Volatile matter,	6.50	
Ashes,	9.50	a larger amount no doubt than the average of the vein, being so near the crop.

2. *The Carey Vein.* A shaft sunk 38 feet shewed it to be so far five feet six inches thick. The coal is at present soft and dry, readily shivering into flakes. It was thought likely to prove an excellent vein to work when at sufficient depth; having only one inch of slate in the whole vein, and "first rate top and bottom slates."

4. *The Lea Vein.* Coal struck at only six feet from the surface: at first four feet, then five, then six; and at 28 feet deep it was about seven feet thick, and was not pursued further, on account of the foul air; but was still evidently enlarging. This coal was the best we proved in this series, as regards compactness and hardness. It has a good floor, with a good "undermining" or "holing" of six inches, at the distance of five inches from the bottom slate.

5. *The Five Feet Vein* occurs close to a deposite of balls of iron ore. This coal, at the depth of 22 feet, was already hard and conchoidal, and of good quality.

7. *The Stone Tunnel Vein* is as yet but imperfectly formed, being only 30 or 40 feet from the surface. It occurs near the north end of the tunnel, which is 164 feet long.

This work was begun in 1830, with the design of penetrating the mountain to intersect some northern coal veins, of which we are not sufficiently apprised to detail in the preceding section. The mouth of this tunnel is 290 feet above the drift No. 2, in Black Spring Gap—1,135 feet above the Pennsylvania canal.

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Gold Mine Gap. No researches have been made on the Fourth mountain hereabouts.

Rausch Gap. At the foot of the Fourth mountain, opposite to this gap, Dr. Kugler, in 1827, opened one good vein of five feet; one other above five feet; one of three feet, and one "very handsome vein" on the summit.

On this mountain the first bench of puddingstone is not less than 50 feet thick, dipping to the south about 70 degrees, or a little less. After passing some soft interposing strata, this bench is succeeded by a second, with another flat of 200 to 300 feet. On this second flat is Dr. Kugler's opening, on a regular and beautiful coal vein 3½ feet thick, which he considered the best in the district, as regards regularity of roof and floor.

No further researches have been made in the Fourth mountain, until at five miles distance, westward, some incomplete explorations occur in the land of the Dauphin and Susquehanna Coal Company, and this is the amount of what we know respecting the northern group of coal seams, until we arrive at the Six mile openings. To the circumstance that they will always be the last put in operation, must be attributed the comparatively small amout of examination which they have received. They must necessarily all be mined from the south side of this mountain, and the southern inclination of the strata will facilitate the means.

Iron Ore. We have nothing under this head to add to the details which incidentally occur in the foregoing pages. The search for coal has been altogether the object; while the discovery of iron ores arose from accident alone. We have reason to believe that the bed of argillaceous carbonate of iron, accompanying

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the coal vein No. 5, at the east end of the property, is continuous, or co-extensive with that vein, as it has been traced there about half a mile. This ore occurs in large balls of first rate quality, the examination of which was impeded by the abundance of slipped rocks covering the surface. Superficial hæmatites are very abundant.

AMOUNT OF COAL ACCESSIBLE FROM THE GAPS.

We might preface a statement of this nature with similar remarks to those already made in reference to the estimated quantity of coal on the Dauphin Coal Company's lands; but it will save unnecessary repetition by referring to our observations under that head.

Southern Group. We have proved the existence at one end of this property of 54½ feet of coal, in the southern group of veins, and at the other extremity, of full 40 feet: the mean of which is above 47 feet. Then 12,334 yds. × 83 × 16 = 16,379,552 cubic yards, above water level. According to the specific gravity of certain veins, the cubic yard weighs more than one ton by from a tenth to a seventh. This would extend the amount two millions of tons more. We have also taken the vertical height in all our calculations, whereas the veins dip or incline, thereby lengthening the true breast of coal.

As a safe calculation we will estimate on the first sum or . . . . 16,379,000 tons.
From this we will still deduct, for waste and contingencies, one-fourth 4,094,000 „

Leaving for the clear amount of coal, obtainable without tunnels, from the *Southern Group* of seams, 12,285,000 „

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Amount brought forward	12,285,000 tons.
Northern Group. Thirty-six feet and a half of coal were proved near the Schuylkill county line, and of this quantity of coal 17½ feet were opened fronting Rausch Gap. The mean is nine yards. Opposite this gap the Fourth mountain is seven or eight hundred feet above the lower coal openings. We will take a low average of only 70 yards. Then, 1,200 yds. × 9 × 70 = 7,560,000 by tunnels into the North mountain. The increased breast acquired by the sloping of the veins, 65 degrees, would of itself be adequate to the usual allowance for waste, &c., and at the same time the thickness of veins being merely taken from their outcrops, is probably equivalent to a similar allowance. But to avoid the chance of exaggeration, we will still make the deduction of a fourth for contingencies, which will reduce the amount of coal above water level in the north group to	5,670,000 „
Making the gross quantity	17,955,000 „

Coal attainable below Water Level.

Rausch Gap, being the point from whence the great bulk of coal will be drawn, must be first taken into consideration.

A tunnel 1,900 feet long will reach the Pitch vein

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No. 1, at the depth of 150 feet below its present water level. It will cross the entire southern series and will intersect the Grey vein in 830 feet more.

Then, 12,334 yds. × 50 × 16 =	9,867,200
From which deduct ¼th as before	2,466,800
	7,400,400 = the

number of cubic yards, (say tons,) in the southern area, within the respective levels of 720 and 570 feet above the Pennsylvania canal. Proportionate quantities of this amount can also be obtained by means of tunnels, at 50 or 100 feet deep, beneath the present water levels in Gold-mine and Black Spring Gap.

To the previous amount which we have estimated for the northern group, we will add nothing here. The feasibility of carrying a tunnel through the broken strata in the centre between the two mountains, is questionable, on many grounds not necessary now to enlarge.

To sum up the amount of coal workable within this area, making all the requisite allowances, as set forth in the foregoing details, it only remains to state that it is 25,355,000 cubic yards or tons.

At the annual rate of 140,000 tons, which was the amount shipped from the Lehigh Coal and Navigation Company's works in 1839, the amount above stated would be a supply for one hundred and eighty years.*

Result of the Mineral Explorations.

That enough coal exists upon the Stony Creek

* Enormous as this mass of coal appears, it is probably not equal to the quantity consumed and exported in Great Britain in a single year; that amount having been recently estimated at near *thirty millions of tons.*

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Estate to justify almost any scale of business, has long ago been anticipated, and is now confirmed, to the satisfaction, we presume, of all parties interested therein.

In the progress of the foregoing details, the points have been indicated where coal operations can be commenced, as soon as the means of transportation are provided. But as regards a *perfect* acquaintance with its mineral resources, it is equally obvious, that our information cannot be viewed as complete; particularly with reference to iron ores.

When we traverse the rugged surface of this wilderness, approachable only to the pedestrian, and toil over the lengthened space beneath which the many coal seams extend, and perceive how "few and far between" are the glimpses of these treasures, we are then sensible that great as have been the labours bestowed, they are scarcely adequate to its full developement. Years of patient research will alone ensure a complete knowledge of the district.

It is very probable that good seams of coal and iron, in certain positions, have never been looked at. Neither has it been practicable to devote the necessary time and labour to the ascertainment of all such indications as have presented themselves. We have, even now, a very imperfect knowledge of the coal of Rausch Gap. However valuable the information when acquired, we must be content to obtain it by degrees, resting meanwhile assured that enough has been already made known, to furnish employment for the industry and capital of generations to come.

Quality of the Coal on the Stony Creek Estate.

This has been indicated, as we proceeded, by the

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descriptive notes and some tables of analysis. It is no new discovery to point out that, commencing with the free burning variety of anthracite which yields a certain quantity of yellowish white flame under combustion, the coal gradually becomes less compact, less dense and ponderous, and more inflammable, as we advance from east to west. The coals of the Dauphin Coal Company possess from fourteen to seventeen per cent. of volatile matter. Those on either side of Rausch Gap occupy an intermediate or transition stage, and contain about eleven per cent. It would seem from the various experiments of the last few years, that coal answering to the latter description is singularly well adapted, in its raw state, to the manufacture of iron.

Improvements on the Stony Creek Estate.

A large dwelling-house was erected in 1830–31, for the use of the proprietors and their agents, on the summit of the Sharp mountain, at the position called Mount Eagle, about half a mile from the Schuylkill county line. A smaller house, in the same vicinity, was also built for the accommodation of the miners, at Black Spring Gap. Temporary houses were subsequently put up for the same purpose at Gold-mine Gap and Rausch Gap.

Mount Eagle Road. A road was made, under the direction of the proprietors, from the dam or reservoir near Fishing Creek Gap, over the Third mountain, by Black Spring Gap, and down the north side of the Fourth mountain to Williams' and Clarke's valleys. An order was obtained from the court of Schuylkill county for this purpose, so far as relates to that county,

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the 4th of December, 1829. The Dauphin and Susquehanna Coal Company, in order to expedite the work, agreed to pay towards it a sum equal to what the proprietors of the Swatara furnace should pay, and a subsequent order of the same court confirms it as a public highway.

Virtuous Spring Road. At an early period, even prior to the revolution, an order from the court of Lancaster county* directed a survey to be made of a road leading from Lebanon, through Indian Creek Valley, to the "Virtuous Spring," and this road was subsequently directed to be completed. It was, however, not finished further than to the Second mountain; but measures have been taken to carry the order into effect, by completing the road to the Cold Spring. This will assist in opening a communication to that part of the estate.

Powell's Valley Road. An order for a road leading from Powell's Valley eastward, up Powell's Creek and through the northern tracts of this estate, towards Pottsville, has been recently obtained, and will contribute to render the lands in that direction more accessible.

A rough wagon road of three miles has also been made from the northern tracts into Wiconisco valley, through which the Lyken's valley rail-road passes.

From Mount Eagle a wagon road has been made two miles westward, and the remaining three are partially opened as a horse road, to Rausch Gap. From thence to Yellow Springs is about five miles more, of ground by no means difficult for a continuation of the same road to that which has just been completed from

* Lebanon county then formed a part of Lancaster county.

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the west, as far as Yellow Springs Gap. The course for such a road was marked out in December last. Were this junction effected, an important desideratum would be accomplished for the mutual convenience of the Coal Company and the owners of this estate, that of a continuous path or horse road, extending twenty-seven miles.

When the proprietors commenced their investigations, there was no road open beyond the school-house, only three miles east of Dauphin or Port Lyon. Thirteen miles of the most difficult portion have been carried on, and ten yet remain before a practicable junction can be effected. We are, therefore, still without the power of communication between the Susquehanna at one end and Mount Eagle at the other, except by very circuitous routes; so that we can reach Philadelphia, 116 miles, in less time than we can pass by any carriage road leading from Port Lyon to Mount Eagle. In this case the elevated mountain region occupied by the coal measures presents a barrier against Clarke's Valley on the north, as does Second mountain against Fishing Creek Valley on the south; and as there is not a single gap in either, along the entire length of Dauphin and Lebanon counties, the only resource is to form parallel mountain and valley roads for ourselves; which sooner or later must be done.

PROJECTED IMPROVEMENTS.

Stony Creek Rail-road has been sufficiently described at p. 25, of the Report to the Coal Company, to which the reader is referred.

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Evening Creek Extension of the Stony Creek Rail-road eastward.

As may be inferred from the report of Mr. Miller on the Stony Creek rail-road, that measure contemplates ultimately a prolongation in an easterly direction, for the purpose of bringing the anthracite of Black Spring and Gold-mine Gaps, and the intermediate coal of Rausch Gap, to the State canal as the nearest way to tide.

TABLE V.

Shewing the comparative distances to market from the Eastern Mines.

Position of Mines.	To Baltimore.		To Havre de Grace.		To Philadelphia.
	By Stony Creek.	By Union Canal.	By Stony Creek.	By Union Canal.	By Union Canal.
	MILES.	MILES.	MILES.	MILES.	MILES.
Black Spring Gap,	160	168	106	114	133
Gold Mine Gap,	159	169	105	115	134½
Rausch Gap,	155	173	101	119	138¾

No survey or report on the most eligible route has yet been submitted to the proprietors by their Engineer. One of the three following modes will have to be decided upon.

1st. To carry on the ascending grade of Stony Creek so as to strike the eastern gaps as high up and as near to the coal therein as may be.

2nd. To follow the descending grade of Evening Creek from the dividing ridge between it and Stony Creek, and thus to form a continuing link in the main chain of road from the State canal to Schuylkill county.

3d. To graduate a road from the highest admissible point in Rausch Gap, and to descend to the proposed Fishing Creek rail-road and to the Union canal feeder at Port Mifflin.

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Of these three routes the last appears to be the most objectionable, and the first appears to hold out the most advantage to the two estates through which they will pass.

Very recently a reconnoissance of this ground has been made by Col. Aycrigg, C. E., for the purpose of ascertaining the relative levels and distances of the principal points here and in the Swatara coal district. In the Appendix B, Table VIII., we subjoin the table with which we have been favoured by that gentleman, embracing all these and other important local details.

Route from Rausch Gap across Second Mountain to the Reservoir.

A survey of this route, comprehending three inclined planes, was made in 1827, the particulars of which were reported on by Dr. Kugler. He found the descent to Stony Creek from the summit of Second mountain, 298 feet; and to Trout Run, on the south side, 561 feet.

In 1830, another survey was completed by A. Young, the result of which shews the descent of Sharp mountain from Rausch Gap to Stony Creek to be 240 feet; ascent to the summit of Second mountain, in a depression there, 338 feet; descent to the Swatara reservoir, near Swatara Gap, at four feet water, 702 feet; the whole distance being a little upwards of three miles. In this case, the saving in point of distance to market, would be 12 or 13 miles, it being thus much shorter than by the Port Mifflin route.

These three gaps are exactly opposite to each other. A person standing on the lofty summit of the Fourth mountain, and looking south, perceives Rausch Gap,

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the depression of Second mountain, and Swatara Gap in the Blue mountain, ranging in one straight line.

Route from Rausch Gap over Second Mountain and by Indian Creek Gap.

This suggestion embraces a similar route to the last, over the depression on the summit of the Second mountain, not far from which one of the branches of Indian Creek has its rise. Along this, the line of rail-road, with or without an inclined plane, as the survey may point out, has been proposed to be conducted to the Union canal near Harper's; from which point it is 116 miles by canals to Philadelphia, and 89 miles by canals to tide water at Havre de Grace.

The contemplated saving is 12½ miles in the distance to Philadelphia, and 20 miles in that to tide at Havre; being that much shorter than by going east round by Port Mifflin. It is also from 20 to 30 miles nearer tide from Rausch Gap than from the body of the Swatara coal. In a straight line it is only seven miles from the mines to Harper's; but the rail-road route will probably extend the distance to about ten miles.

If the Second mountain is to be crossed at any point between Port Mifflin and the Susquehanna, this route seems to offer the greatest advantage in saving of distance, and also in avoiding delay; as there are only fifteen locks between Harper's and Middletown. But, as in the preceding plan, it is encumbered with the disadvantage of two inclined planes, crossing the Second mountain; whereas the Stony Creek route is nearly the same distance to tide water, and passes for 21 miles almost entirely over the property of the parties at whose cost the expenditure must be made.

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Extension of Stony Creek Rail-road to the Pottsville and Reading Rail-road.

Two or three rail-road routes have been suggested, for consideration at some future day; whereby a shorter line of communication with Philadelphia and the east would be effected.

I. From Dauphin or Port Lyon, the Stony Creek rail-road, after passing by various coal stations adjoining that valley, may be extended to Pinegrove, or 33 miles; and thence to Schuylkill Haven 14 miles; making 47 miles to the Reading rail-road or to the Schuylkill canal. The distance, therefore, from Black Spring Gap to Philadelphia, by that rail-road route, 86 miles, would be 108 miles.

II. Varying the route, to pass by Port Clinton, the distance is 104 miles.

III. Another route suggests itself in the proposed Fishing Creek rail-road to Lorberry Creek rail-road, and thence to the W. W. Branch rail-road.

TABLE VI.

Black Spring Gap Coal Mines.

	COMPARATIVE ROUTES.	MILES.
	To Philadelphia.	
1	Down Stony Creek to Port Lyon, 26; to Middletown, 17; Union and Schuylkill Canals, 145,	185
2	Down Stony Creek, 26; by Lancaster Rail-road, 116,	142
3	By Port Mifflin, 4½; Union Canal, 66½; Schuylkill Canal, 62,	133
4	By do. and junction by a Rail-road with Reading Rail-road,	107
5	By Route No. 1, by Scuylkill Haven, as above,	108
6	By Route No. 2, by Port Clinton, do.	106
7	By Route No. 3, by W. W. Branch Schuylkill, as above,	118
8	By Tidewater at Havre, Delaware City and the Delaware,	185
	To Havre de Grace.	
9	By Stony Creek Route,	106
10	By Union Canal,	114
	To New York.	
11	To Schuylkill Haven, 22, Hamburg, 17; Easton, 46; Morris Canal, 101,	186
12	Do. by Port Clinton,	184
	To Baltimore.	
13	By Stony Creek Route,	160
14	By Union Canal Route,	168

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The Pottsville coals could reach New York by this route, No. 11, in 166 miles. At present the nearest communication is 236 miles.

The Lorberry Creek coals could reach Philadelphia in 103 to 105 miles, by this rail-road route. At present the distance is 139 miles.

Illustrations of the foregoing Reports and of the Coal Statistics of Pennsylvania generally.

The maps, diagrams, and sections hereto annexed, and the accompanying table of comparative distances from coal mining stations to market, have been compiled from a great variety of sources; but chiefly from official documents and reports which have been from time to time brought before the public. The principal and original object, of course, was the shewing the peculiar position of the coal lands described in these reports. The plan has been extended so as to shew the situation of all the principal collieries and coal deposits east of the Alleghany mountain. We have been induced to do this, knowing how much this species of condensed information was needed.

Notwithstanding the care we have taken to render the tables authentic, as regards the distances, elevation, lockage, &c., it is far from improbable that, among so many data, some may yet need correction. This is the more likely to occur when we note the discrepancies visible even in the official documents themselves.

The *Diagram*, No. 145, is partly compiled from the accompanying tables, and partly from other available sources. A detailed description of its objects, and the information it is designed to furnish, is unnecessary.

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The *General Map*, No. 144, has been constructed as an especial illustration of the coal statistics of Pennsylvania, in connection with the statistical tables hereto appended. It is not alone useful to the purposes of those who are immediately interested in the present publication; nor even is its utility confined to the coal trade. It extends to all who are interested in the public and private improvements of this and the adjoining states, in the transportation of produce and in the facilities of travel.

The *Local Map*, No. 138, represents on an enlarged scale the individual tracts, not only belonging to the Dauphin and Susquehanna Coal Company, and to the owners of the Stony Creek Coal Estate, but those of various companies and proprietors in the Swatara coal district, the Lyken's Valley and Bear Valley districts, and extending nearly to the W. W. Branch of the Schuylkill. On this map is introduced whatever is most likely to give it local value, such as sketches of the projected improvements, distances, elevations, tracings of coal veins, mineral deposites, and topographical features.

Geological Diagrams, Plate No. 147, consist of six transverse sections across the southern fork of the First or Sckuylkill coal region, at the respective gaps which have been designated in this report as proper positions for working out the coal. In these sections every thing of a hypothetical character has been excluded. Even the details of stratification were omitted, as not immediately essential to our plan; and only the coal crops and seams which have been actually proved on the ground, and their inclination and thickness ascertained, are introduced.

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Town Plot of Port Lyon or Dauphin, Plate No. 148. This has been newly engraved from a recent re-survey of the site.

CONCLUSION.

The remarks with which we closed our report of the Coal Company's property, are in several material respects applicable to this: consequently need not be recapitulated.

As regards the routes by which the coal can be best conveyed from the Stony Creek Estate to markets or tide, we have given brief outlines of those which have been, or are likely to be, suggested. At this early stage we are unprepared with official reports from the Engineer as to the most advisable route to be pursued, nor has the subject yet formed matter of deliberation with the owners.

Ere we finally close this subject we have only one more remark of a general character to make. Nothing perhaps tends more completely to illustrate the importance of the coal trade, than the fact that the four principal avenues to the anthracite regions of the state, (without mentioning the numerous smaller rail-road and canal lines, and the immense amount of individual capital therein invested,) required the investment of about seventeen millions of dollars, chiefly to become the carriers of this mineral.

We shall not further advert to the vast sums thus expended, nor need we compare these expenditures with the small amount required for a similar purpose, to make a rail-road of thirteen miles to the Dauphin and Susquehanna Coal Company's bituminous coal, or of twenty-one miles to the free burning anthracite on

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the Stony Creek Estate, to open the resources of this important district.

Limited as have been our means of ascertaining the amount of iron ore on this property, we have yet been able to speak with certainty as to its existence in association with the coal strata, to an extent even beyond our early anticipations.

We have arranged in the most convenient form for reference, all the details we have acquired during this and former investigations; and have exhibited the probable quantity of anthracite which can be procured at the principal working positions. One principal fact we were successful in determining; namely, the continuity of the best veins leading through the estate, and were perfectly able to identify, from their peculiar characters, the best veins at the respective gaps.

We have thought it expedient to recommend to the Dauphin and Susquehanna Coal Company not to enter into coal operations themselves, but to lease to others the coal lands and veins within their estate. The same views are applicable in this case. When the communications are completed to the drifts now open on the main veins, the proprietors will be in a condition to grant leases of certain portions of their mineral property; and as the area is so great they may be induced to subdivide it, and to sell a part, comprising therein a proportionate quantity of timber and mountain land.

In the Appendix we propose to annex several notes in reference to the Stony Creek coal district; a schedule of the tracts comprised within the estate, and a copious table illustrative of the coal statistics of Pinegrove and East Hanover townships: to this we

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shall add various tables and notices, comprising a body of information which cannot fail to be useful and interesting, relating to the anthracite, the bituminous coal, and the iron of Europe, their analysis and amount, compared with those of America; and shall endeavour to exhibit the present condition of the coal and iron business in England, Scotland, Wales, Ireland, France, Belgium and Germany, with the especial intent of illustrating, more or less remotely, the value of similar resources in this country; all which subjects we conceive are compatible with the legitimate object of the foregoing pages.

Respectfully,

RICHARD C. TAYLOR.

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APPENDIX.

(A.)—TABLE VII.

Schedule of the Lands comprising the Stony Creek Coal Estate.

No.	Warrantee Names.	Quantity. Acres.	Perches.	County.	Township.
	The 39 Southern Tracts.				
1	Joseph Heister,	419	118	Dauphin.	Rush.
2	Martin Meyer,	437	70	Lebanon.	East Hanover.
3	Conrad Meyer,	426	93	do.	do.
4	Michael Meyer,	478	147	do.	do.
5	Nicholas Sheffer,	435	106	do.	do.
6	Christina Koon,	426	41	do.	do.
7	Catherine Koon,	405	42	do.	do.
8	Daniel Sheffer,	388	23	do.	do.
9	John Sheffer,	416	113	do.	do.
10	Peter Sheffer,	346	13	Dauphin.	Rush.
11	Daniel Koon,	403	59	do.	do.
12	Elizabeth Koon,	407	132	Lebanon.	East Hanover.
13	Christian Koon,	381	55	do.	do.
14	Conrad Feger,	415	11	do.	do.
15	Conrad Koon,	416	70	do.	do.
16	Valentine Koon,	407	87	Dauphin.	Rush.
17	John Christ,	407	36	do.	do.
18	Philip Kremer,	421	29	Lebanon.	East Hanover.
19	Peter Rapp,	426	00	do.	do.
20	Daniel Linebach,	454	56	do.	do.
21	Gabriel Heister,	413	66	do.	do.
22	Peter Nagle,	383	44	do.	do.
23	Peter Frailey,	402	33	do.	do.
24	John Schenfelder,	418	00	do.	do.
25	Henry Dickle,	400	50	do.	do.
26	Frederick Rapp,	400	09	do.	do.
27	Michael Rapp,	434	102	do.	do.
28 a	George Gardner, (part of,)	409	00	do.	do.
29	John Rapp,	387	80	do.	do.
30	Catherine Rapp,	405	56	Dauphin.	Rush.
31	Juliana Rapp,	407	00	do.	do.
32 a	Adam Rapp, (part,)	367	132	do.	do.
33	Eve Reitmeyer,	415	36	do.	do.
36 a	Andrew Eisenbise, (part,)	300	00	Lebanon.	East Hanover.
37	Adam Grauder,	444	30	do.	do.
38	Henry Fleisher,	420	66	do.	do.
39	Jacob Bright,	362	63	do.	do.
40	John Weldy, (part,)	371	133	Dauphin.	Rush.
		1,5463	121		
118	Wharf at Port Mifflin,		80	Schuylkill.	Pinegrove.
		15,464	41		

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No.	Warrantee Names.			Quantity. Acres.	Perches.	County.	Township.
	The 32 Northern Tracts.						
43	Christian Madeira,			408	94	Dauphin.	Rush.
44	Samuel Madeira,			408	94	do.	do.
45	John Hunter,			423	64	do.	do.
46	William Scott,	401	40			do.	Jackson.
47	George Eckert,	401	40			do.	do.
48	Marks J. Biddle,	401	40			do.	do.
49	Jacob Bower,	401	40			do.	do.
50	John Spohn,	401	40			do.	do.
51	Adam Withelm,	401	40			do.	do.
		2407	80				
	Twell's interference,	846	00				
				1561	80		
52	Jacob Withelm,			401	40	do.	do.
53	Philip Withelm,			431	155	do.	do.
54	Henry Weber,			433	00	do.	Rush.
55	George Boltz,	401	40			do.	Jackson.
56	Simon Boltz,	402	40			do.	do.
		803	80				
	Bull's interference,	211	00				
				592	80		
57	Valentine Boltz,			394	00	do.	Rush.
58	Frederick Gerhart,			400	80	do.	Jackson.
59	George Bretzious,			400	80	do.	do.
60	George Radenbach,			452	40	do.	Rush.
61	Jacob Radenbach,			481	00	do.	do.
62	Adam Petticher,			428	120	do.	do.
63	John Petticher,			400	80	do.	Jackson.
64	Jacob Petticher,			400	80	do.	do.
65	Jacob Bretzious,			400	80	do.	do.
66	Conrad Petticher,			451	91	do.	do.
67	Michael Petticher,			400	80	do.	do.
68	Michael Bretzious,			400	80	do.	do.
69	Adam Smith,			400	80	do.	do.
70	Jacob Smith,			400	80	do.	do.
71	Mathias Smith,			387	40	do.	do.
72	Mathias Miller,			401	40	do.	do.
73	John Miller,			401	40	do.	do.
75 a	Thomas Bird, (part,)			300	00	do.	Rush.
				11,961	98		
	The 16 Western Tracts.						
82	John Parker,			500	00	do.	do.
83	Alexander Symington,			500	00	do.	do.
86	Charles Bird,			500	00	do.	do.
90	Joseph Lyon,			388	80	do.	do.
92	Benjamin Minsker,			311	15	do.	Middle Paxtang.
93	Anthony Pretz,			43	00	do.	do.
99	Dorcas Taylor, mining privileges,			58	40	do.	do.
100 a b c d e	Ludwig, Minsker & I. Shaffer, mining privileges only,			239	00	do.	do.
101	John Musser,			114	00	do.	do.
102	John Richmond,			85	00	do.	do.
103	John Cochran,			28	80	do.	do.
108	John Bell,			75	50	do.	do.
	16 Western Tracts, - - - -			2,842	105		
	39 Southern Tracts, - - - -			15,464	41		
	32 Northern Tracts, - - - -			11,961	98		
	Sum of the 87 Tracts, - - -			30,268	84		
	Six per cent. allowance for roads,			1,816	16		
	Total, - - - - - - - - -			32,084	100		

Appertaining to this Estate is also an unsettled claim to Tract No. 74 in the warrantee name of Philip Weber, in Schuylkill county, containing 433 acres 153 perches.

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(B.)—TABLE VIII.

Digest of the Heights and Distances of points in the Swatara Coal region, and places connected therewith, as far as ascertained up to the present time, April, 1840.

	Distance from place to place.	Distance from Philadelphia by way of Union Canal.	Distance from Havre de Grace by Union and Susquehanna.	Length of Canal to Philadelphia by Union.	Length of Rail-Road to Union Canal.	Length of Rail-Road to Susquehanna.	Tail of Rail-Road to Union Canal.	Rise and fall from point to point.	Height above tide.
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Feet.	Feet.	Feet.
1. Reading from Philadelphia,	62.0	62.0						169.0	169.0
2. Lebanon on summit Union Canal,	43.0	105.0						311.0	480.0
3. Water-works at junction of Branch from Coal region,	7.0	112.0						86.5	393.5
4. Columbia basin from Havre de Grace,	45.0		45.0					235.0	235.0
5. Middletown at western end of Union Canal,	18.0	142.0	63.0					52.5	287.5
6. Water-works fr. Middletown,	30.0	112.0	93.0					106.0	393.5
7. Surface of feeder pond from Water-works, (No. 3,)	7.0	119.0	100.0					3.5	397.0
8. Surface of Large Swatara Reservoir at the Dam,	4.0	123.0	104.0					62.6	459.8
9. Port Mifflin at the mouth of Fishing Creek, (on the reservoir,)	5.5	128.5	109.5	128.5	0.00	29.0		0.0	459.8
10. Junction of Evening Creek with Fishing Creek,	2.3	130.8	111.8	128.5	2.3	26.7		165.2	624.8
11. First Coal in Fishing Creek Gap of Sharp Mountain,	2.3	133.1	114.1	128.5	4.6	28.8	387.2	222.0	846.8
12. Junction of Baird's Run with Fishing Creek at foot of Fourth Mountain,	0.40	133.5	114.5	128.5	5.0	29.2	433.2	46.2	893.0
13. Summit between Baird's Run and Lorberry Creek,	1.60	135.1	116.1	128.5	6.6	30.8	706.9	273.5	1166.5
14. 'North' or 'Mammoth Vein' on Lorberry Creek, (the present main supply,)	1.10	136.2	117.2	128.5	7.7	31.9	747.4	40.5	1126.0
15. Pine Grove from No. 9 by Branch Canal,	5.0	133.5	114.5	133.5	0.0	34.0		30.7	490.3
16. Rail-road level at Company's Chute,	0.0	133.5	114.5	133.5	0.0			13.0	503.3
17. End of first grade,	0.875	134.4	115.4	133.5	0.9			7.0	510.3
18. End of second grade,	1.475	135.8	116.8	133.5	2.4			47.2	557.5
19. End of third grade, near the head of Union rail-road,	1.15	137.0	118.0	133.5	3.5			52.0	609.5
20. Foot of inclined plane on Lorberry Creek rail-road,	1.00	138.0	119.0	133.5	4.5			132.75	742.2
21. Foot of 2nd inclined plane, at Peacock vein, Sharp Mountain,	0.44	138.4	119.4	133.5	4.9		352.5	100.54	842.8
22. Foot of 3d inclined plane, at the foot of 4th Mountain,	0.42	138.9	119.9	133.5	5.4		442.2	89.75	932.5
23. (Same as No. 14,) by way of Pine Grove,	0.42	139.3	120.3	133.5	5.8		635.7	193.5	1126.0
24. First coal in Rausch Creek Gap of Sharp Mountain from No. 19,	1.00	138.0	119.0	133.5	4.5		286.7	168.0	777.0
25. Point on Rausch Creek in gorge of Fourth Mountain, 2.40 miles from its mouth,	1.40	139.4	120.4	133.5	5.9		563.7	277.0	1054.0
26. Do. do. 2.83 do.	0.43	139.8	120.8	133.5	6.3		662.0	98.0	1152.0
27. Summit between Evening Creek and Stony Creek, (from No. 10,)	5.40	136.2	127.2	128.5	7.7	21.3	403.0	237.7	862.5

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The heights given in the foregoing table are 2.5 feet less than the corresponding heights, according to the report of the Canal Commissioners, which makes the Middletown basin 290 feet above tide, and consequently, the summit of the Union canal 482.5 feet above tide, in place of 480, as we have always taken it in comparing the heights of different points on the Union canal. The height at Reading is at the surface below the outlet lock of the Union canal.

B. Aycrigg.

(C.)

Memoranda as to the Comparative Weight of different species of Coal in Pennsylvania.

Reference has been occasionally made in the foregoing pages to the peculiarities of certain varieties of coals in Pennsylvania, and to points of agreement with, or difference from, those which occupy the Stony Creek area. We conceive that we shall not depart from the legitimate objects of the present report, in selecting from our notes on this subject, such of them as may tend to elucidate our position.

Information of this description is at present scattered among local and temporary publications, or exists in the possession of a few who have taken the trouble to acquire the data from their individual observations. Whenever the state survey shall be completed, and its interesting results are in the hands of the community, the individual labour which now necessarily attends all such researches as ours, will, it is hoped, in a great measure, terminate.

It has been remarked, that the specific gravity of the coal, both in the First and the Second coal regions of Pennsylvania, increases as we advance from west to east; from the Susquehanna towards the Lehigh; and decreases in weight in proportion as it becomes charged with volatile matter. This circumstance is exemplified by the following table.

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TABLE IX.

First or Schuylkill Region.		Second or Middle Region.	
Localities proceeding from West to East.	Weight of a cubic yard in pounds.	*Localities proceeding from West to East.*	Weight of a cubic yard in pounds.
Lykens Valley, - - -	2224	West Mahanoy Coal, - -	2313
Stony Creek, 6 mile openings,	2244	Hazelton, - - - -	2615
Big Flats, - - - about	2351	Girardville, - - -	2700
Rausch Gap, - - -	2453	Beaver Meadow, - -	2700
Lorberry Creek, - - -	2484		
Pottsville, - - - mean	2504		
Tamaqua, Vein N. - -	2700		
Lehigh, Mauch Chunk, -	2615		
Do. Nesquehoning, -	2646		

The Pennsylvania anthracite appears to be altogether heavier than the European, as appears from the following table.

TABLE X.

South Wales, (Swansea,) -	2131	Wilkesbarre, (Baltimore co.)	2484
France, (Grenoble,) - - -	1809	Pottsville, - - - - - - -	2649
Black Spring Gap, - - -	2351	Tamaqua, heaviest, - - -	2808

(D.)

Bituminous Coals with reference to their adaptation to the making of Iron.

Every species of information which contributes to make the adaptation of a mineral so important in all its varieties to the manufacturing interests, better understood, must be more or less useful. It is desirable, for instance, to know the respective qualities of those coals which are employed on such an enormous scale, on the other side the Atlantic. Especially is it essential to ascertain the applicability of different species, and by different processes, to certain purposes. We know that those results have only been obtained during a long series of years devoted to their developement. They are now the common property of the world, and whatever be their character, we are at liberty to avail ourselves of them.

Subjoined is a list of the analyses of a few of the varieties of coal which are employed in the most celebrated manufacturing establishments in England, Scotland, and Wales, and which have been investigated by distinguished men of science. To this is annexed a few analyses of bituminous coals of the United States, for the purpose of shewing in what respect they agree with or differ from those of Europe.

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TABLE XI.

Countries.		Localities and Classification of Coals.	By whom Analyzed.	Carbon. Per cent.	Bitumen & volatile matter. Gas, Tar, Water.	Ashes and earthy matter. Per cent.
I. England. Fat, bituminous, adhesive Coals, the greater part close burning, or strong burning.	A	Whitehaven,	Kirwan,	57.0	41.3	1.7
		Newcastle,	Thomson,	75.9	22.6	1.5
		Newcastle upon Tyne, Birtley Works,	Berthier,	60.5	35.5	4.0
		Northumberland, Tyne Works,	„	67.5	30.0	2.5
		Staffordshire, Apdale Works, near Newcastle under Line,	„	62.4	34.1	3.5
	B	Staffordshire, Wednesbury Coal Works, Tipton,	„	67.5	30.0	2.5
		Derbyshire, Butterley Cherry Coal,	„	57.0	40.0	3.0
		Derbyshire, Codnor Park, soft Coal,	„	51.5	45.5	3.0
	C	Cannel Coal of Lancashire,	Kirwan,	75.2	21.7	3.1
		Do.	Karsten,	50.5		0.5
		Do.	„	56.0		5.5
		Do.	„	56.5		13.3
II. Scotland. Dry Coals, not very adhesive; can be used crude in the furnace with heated air—*open burning*.		Clyde, splint Coal,	Mushet,	59.0	36.8	4.2
		Clyde, clod Coal, richest,	„	70.0	26.5	4.5
		Clyde, Glasgow soft Coal,	Thomson,	42.3	47.7	10.0
		Clyde, Glasgow splint Coal,	„	55.2	35.3	9.5
		Clyde, near Glasgow,	Berthier,	64.4	31.0	4.6
		Calder, near Glasgow,	„	51.0	45.0	4.0
		Monkland, do.	„	56 2	42.4	1.4
III. South Wales. Very dry Coals, with excess of Carbon—*open burning*.		Dowlais,	„	79.5	17.5	3.0
		Cyfarthva, near Merthyr Tydvil,	„	78.4	18.8	2.8
		Pen y Daran, Iron Works,	„	76.8	20.0	3.2
IV. North America. Bituminous, dry Coals, not adhesive—*open burning*.		Short Mountain,	Ellet,	75.5	15.3	9.2
		Broad Top Mountain, Riddle's,	Clemson,	70.1	16.7	13.2
		Big Flats,	M. C. Lea,	71.2	15.4	13 4
		Rattling Run,	„	76.1	16.9	7.0
		Cumberland, Savage River, M.	W. Hayes.	77.9	15.6	6.5
			Dr. Jackson.	77.0	16.0	7.0
		Tennessee, Cumberland Mountains,	Dr. Troost,	71.0	17.0	12.0
		Tioga, Pa. Blossburg, Coal Run,	Clemson,	75.4	16.4	8.2
		Tioga, Pa. Do. Bear Creek,	„	73.7	15.0	11.3
		Tioga, Pa. Do. Bloss Vein,	„	73.0	15.6	11.4
		Tioga, Pa. Johnson's Run Coal,	„	69.3	14.6	16.1
		Blair's Gap, Pa.	„	77.0	15.0	8.0
More adhesive,		Philipsburg,	Johnson,	68.0	22.0	10.0
		Karthaus,	„	68.1	26.8	5.1
		Richmond, Va. Willis' Pit,	Clemson,	66.6	28.8	4.6
		Richmond, Va. Anderson's Pit,	„	64.2	26.0	9.8

A. Coals which cannot be employed in a crude state in Iron Works.
B. Coals which cement less in the fire, and which it is practicable to use raw in furnaces worked with heated air.
C. Cannel Coal, the best quality for illuminating gas.

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In the foregoing table of analyses of bituminous coals, they are so arranged as to exhibit the varieties in the different countries, and a classification of their distinguishing properties. Hence the foreign coals can readily be compared with the American, and the adaptations of the latter may be assigned with some degree of confidence. By this also will be seen how greatly the bituminous coals that occur eastward of the Alleghany mountain and along a certain breadth of the Alleghany range itself, resemble each other, in their constituent properties. And further, what a remarkable resemblance they bear to the coals of the great iron manufacturing district of South Wales.

I. In the first class, series A, the English coals of the north are chiefly fat and very adhesive or caking: swelling much in the fire. The hot air blast is successfully applied with these in the furnace. But as their tendency to cement together in a solid mass, when in the fire, is such as to prevent a free draught or passage of the air through the furnace, it has been found indispensable to submit the coals to a preliminary process, and to reduce them to *coke*. Thus the difficulty is wholly removed; and a light, cellular and purely carbonaceous substance, easily ignited, is substituted for the unmanageable coal in its crude state. The average quantity of carbon which these coals possess, is stated to be sixty-three per cent.

Series B, more southward, in Derbyshire; the coals, although containing as much and even more bitumen, do not melt together like those of Northumberland. They scarcely change their form even in the state of coke. The varieties, having this property, admit of their being used in the *raw state*, but require the introduction of hot air into the furnaces.

II. In the second class, the Scotch coals, although containing as much bitumen as those of the north of England, are of the kind denominated *dry coals*. They cement together, but without change of form, and are not so adhesive as the fat English coals. These were heretofore coked before being put into the furnaces; but recent improvements shew that, with the application of heated air, they can be employed without being previously carbonized. Their average proportion of carbon is fifty-six per cent.

III. In the third class, the Welsh coals, which possess only from seventeen to twenty per cent. of bitumen and volatile matter, are "very dry coals, with excess of carbon," and are even styled by M. Dufrenoy, "true anthracites." These coals do not coke or cement

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together in a mass, although each individual fragment is susceptible of conversion separately into coke, and consequently, do not offer a similar obstruction to the current of air in the furnace, like those of the first class. It has, therefore, been found that they may be employed in a crude state in the cold air furnaces of South Wales.* This class contains a larger proportion of carbon than the two others, being seventy-eight per cent.

IV. It is evident, by inspection of our table, to which of these three classes the bituminous coals of Stony Creek, Broad Top mountain, Cumberland, Tioga, &c. properly belong. All of these will probably be found capable of being used in the blast furnace, without being carbonized, the expense of which will be consequently saved. In amount of carbon, these Pennsylvania coals nearly equal those of Wales, being about seventy-five per cent. Like the latter they are dry, and although most of them are convertible into coke, they do not melt or cement when heated, to an extent that is likely to impede the passage of air in the furnace.

The Schuylkill or Southern coal region of Pennsylvania, possesses other points of resemblance to the great coal basin of South Wales. This basin is 94 miles long, and averages about 15 miles in breadth, containing about 1,400 square miles. Of this area, 74 miles in length consist of anthracite, which can scarcely be distinguished from the Lehigh and Pottsville varieties, except in the circumstance of its evolving, when burning, a much larger quantity of inflammable gas; and 20 miles of coal containing various proportions of bitumen, but which, in component mineral properties, resembles strongly the bituminous coal of Stony Creek.

This little region of bituminous coal in South Wales, whose area is 25 miles by 20, contains no less than one hundred and twelve blast furnaces, which produce four hundred and ninety-five thousand tons of iron annually. The south-eastern portion of this bituminous district has its coal the most highly impregnated. Here, therefore, the use of heated air in the blast furnaces was first tried, and adopted originally with some difficulty; but now there are

* For the greater portion of the information condensed in the above statements, we are indebted to the admirable report of M. Dufrenoy in the Annales des Mines. See also the Journal of the Franklin Institute, Vol. XV., and subsequent volumes, for notices of this and other articles of similar importance.

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twenty-three furnaces in operation with the hot air. This quality of coal requires from five to nine days to become thoroughly coked.

On the northern portion the coal is less bituminous; requiring less than half the time to coke. Some impediments arising here under the employment of heated air, it was found that the coal could be used in its raw state with the cold blast, and that about 2¾ tons of coal were sufficient in the furnace to produce one ton of iron.

The following statement exhibits the analysis of this Welsh coal, which has been successfully, for some years, employed there in its crude state; and beside it we will place the analysis of the Perseverance vein of Rattling Run Gap, for the sake of shewing how closely they approximate.

TABLE XII.

	Carbon. Per cent.	Bitumen, Gas, and Water.	Ashes and earthy matter.
Dowlais, the largest Iron establishment in Wales, comprising fifteen furnaces, which make seventy thousand tons annually, - - - - - - - -	79.5	17.5	3.0
Stony Creek Coal, Perseverance vein, several miles in length, - - - - - - - - - -	76.1	16.9	7.0
Alleghany Coal, Blossburg, not yet applied to iron making,	75.4	16.4	8.2
Tennessee Coal, Cumberland Mountain, Kimbrow's vein,	71.0	17.0	12.0
Of these four examples we conceive the Stony Creek coal entitled to preference in making iron, on account of its almost entire freedom from sulphur.			
The coals of the west contain at least double the amount of bitumen.			
Illinois, Ottawa coal, analysed by J. F. Fraser, -	62.6	35.5	1.9
„ Rockwell coal, analysed by C. V. Shephard,	46.5	47.5	6.0

It is not probable that these last, like those of Pittsburgh and Wheeling, can, under any management at present known, be used in a furnace without the preliminary process of carbonization.

We will close this long note with the remark that a similarity of results in analyses, is not necessarily an entire guide. Even as regards chemical results, apparently parallel, discrepancies are discoverable, when the investigation is carried further; and shew the absence or presence of principles that materially influence operative results. In coals containing similar quantities of carbon, those of the north of England and Scotland, for instance, the analytical results, furnished by Dr. Thomson, prove that the relative quantities of hydrogen, carbon and azote materially differ. Again, external properties and characters must likewise be consulted. The structure and texture of the coal, the density, the mode in which it

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burns in the fire, swells or decrepitates, and other circumstances, must be attended to. We have seen, for example, that some of the English coals, containing from 30 to 35 per cent. of bitumen, possess so strong a tendency to melt, cement and coke, as to form a hollow fire, and cannot be used without coking; while other coals which possess 10 to 18 per cent. more of bitumen, swell but little; and though their fragments adhere in the fire, they do not change their form, even in the process of coking. There are abundant examples, of this nature, in the coals of the United States.

(E.)

Progressive increase in the demand for Coal and Iron throughout the world.

One of the characteristics of the age in which we live, is the remarkable increase in the amount of mineral matter brought to the surface of the earth and employed in the useful arts for the service of man. In a work treating on the subject of the coal and iron of this quarter of the globe, we can scarcely refrain from adverting to the enlarged demand for these substances, not only in Europe, but in the United States; and in fact every where else, where the mechanical arts are in cultivation.

Coal in Great Britain. A few years ago the annual consumption and exportation of *coal* were estimated at ten millions of tons. In 1829, the consumption of England and Scotland was set down at 14,880,000 tons, exclusive of exportation. In 1835, the amount was supposed to be 19,280,000 tons. In 1836, it was considered to be from twenty to twenty-five millions, and the calculation has been subsequently extended, by one or two authorities, as high as thirty millions of tons.

Coal in France. The coal trade of her forty-six coal fields has advanced at an equally rapid rate, as may be seen from the following official decennial statement of the quantity raised, and its value.

TABLE XIII.

Years.	Bituminous Coal.		Anthracite.		Lignite.		Total.	
	Tons.	Value in dollars.	Tons.	Value in dollars.	Tons.	Value in dollars.	Tons.	Value in dollars.
1816	764,785	1,548,710	4,723	7,900	25,504	53,945	795,012	1,610,555
1826	1,217,963	2,499,897	14,966	28,761	68,116	140,164	1,301,045	2,668,822
1836	2,394,299	4,800,086	54,296	133,200	96,240	175,267	2,584,835	5,108,553

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The increase between the years 1814 and 1835, is 282 per cent.

In 1837, the bituminous coals raised in France amounted to about 2,272,000 tons, besides 272,133 tons of imported coal from England.

During this period of twenty years the amount of imported coal in France, from various parts, has proceeded nearly in the same ratio of increase as that mined in the country.

TABLE XIV.

Years.	*Tons imported.*	*Imported and Mined.*
In 1816,	315,815	Or, in all, 1,110,827 consumed.
In 1826,	495,325	„ 1,796,370 „
In 1836,	949,373	„ 3,494,208 „

This branch of industry, which is now making even a more rapid progress than these returns exhibit, consists of two thousand two hundred and nineteen establishments, and gave employment, in 1836, to fifty-five thousand seven hundred and thirty-five workmen. This increased consumption is the more worthy of record, because the use of coal in France, for domestic purposes, has always been viewed with extreme dislike.

So great also has the demand for coals for manufacturing purposes arisen in France, that the government has lately been induced to allow the English coal owners to supply them free of duty.

In Belgium, also, the decreased stock of coals and the increased prices have lately led to the remission of all duty on coals imported from England, for the Belgian iron works and manufactories.

In 1837, the quantity exported from Great Britain to foreign countries, but for the most part to Belgium and France, was 1,113,600 tons.

Anthracite in Pennsylvania, United States. During the same period quoted above, the employment of Anthracite has, from a very small beginning, increased in a still more rapid manner. This state may be said to supply all the rest of the states with this fuel.

TABLE XV.

Years.	*Tons.*	
In 1816,		The use of Anthracite was almost unknown until 1820, when 365 tons were first brought to market.
In 1826,	48,115	Brought to market.
In 1836,	696,526	Besides imported Coal, which in 1837 amounted to 4,268,596 bushels, or 142,286 tons.
In 1839,	785,553	Besides about 50,000 tons mined in the Wyoming, Shamokin, Lyken's Valley, and Swatara districts.

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We have at hand no details of the amount of bituminous coal raised and consumed in the manufactories of the state, nor has it yet formed an article of export. On the completion of the great chain of internal improvements in Pennsylvania, particularly that of the canal to tide water, at the mouth of the Susquehanna, an export trade in bituminous coal, of some magnitude, will be established; of which the nearest positions, affording that description of fuel, will of course be the earliest to reap the benefit.

IRON.

Iron in England, Scotland and Wales. It appears from tables recently published in an English periodical, that an increase has occurred both in the number of furnaces and their average products; that in each decennial period is an augmentation of *cent. per cent.* in the number of tons manufactured.

TABLE XVI.

Years.	Furnaces in blast.	Tons per week.	Tons per annum.	Bar Iron. Tons.	Remarks.
1820	227	45	400,000		Coke only employed.
1827	284	47	690,000	480,000	Coke.
1830	315	50	700,000	500,000	Hot blast introduced.
1836	360	60	1,200,000	600,000	Hot blast employed extensively.
1839	417	70	1,512,000	670,000	Anthracite introduced.

The relative proportions of iron made in the British dominions, are by a recent author arranged as follows:

In England, ...	636,000 tons.
South Wales, ...	550,000
Scotland, ...	200,000
Tons in 1839, . .	1,386,000

On the 1st of January, 1840, the amount of pig iron made weekly in the great manufacturing districts of Staffordshire, was as follows:

Furnaces in blast.	Hot air.	Cold air.	Weekly make tons.
142	35	107	9000

At the same time the amount of manufactured iron in the same district required 9,098 tons of pig iron per week; consequently the make of pig iron was then inadequate to the demand. The existing proportion of furnaces worked with hot and cold blast is shewn by this return.

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Iron in Ireland. From Mr. Scrivenor's History of the Iron Trade, (1840,) we learn that great efforts were made to establish iron works at an early period; that much iron ore was known to exist in that country, and in fact that many iron works were at one time established in the provinces. In 1672, there were 6,600 smith's forges in Ireland, giving employment to 22,500 persons.

At the present day it is stated the manufacture of iron is lost to Ireland. A single unsuccessful attempt has been made to revive it of late years; yet at the present time no works are going on.

Iron in France. The increase in the number of furnaces in one hundred years is seven fold: the average produce of each furnace per week has improved fourteen fold, and the gross produce a hundred fold, as shewn below.

TABLE XVII.

Years.	Furnaces	Tons per week.	Tons per annum.	Bar Iron. Tons.	Remarks.
1820			300,000	120,000	Coke was not used until the year 1821.
1827			359,796	146,621	Four-fifths of the fuel used in France is wood.
1830		11	369,207	146,242	
1836	894	11	505,430	201,691	
1839	1000	12	600,000	220,000	Employing 43,775 workmen.

The rapid rate of increase in the developement of the mineral resources of France, of late years, is considered to be owing, in a great measure, "to suggestions offered to the proprietors of works by accomplished engineers" acting under the law of inspection which was passed in 1833. The increase in the value of the coal and iron raised since that period, (including a comparatively small amount of other minerals,) is as follows:

The increased value from 1828 to 1832 is £12,175 without inspection.
" 1832 to 1836 is £1,939,098 under system of inspect.
Value in 1832 - - - - £4,230,039
Value in 1836 - - - - £6,169,138 or 45 per cent.

The value of cast iron, bar iron and steel manufactured in 1836, was £4,975,424 sterling, of which the fuel used in the different processes cost £2,039,767.

The value of foreign iron consumed in France, is as follows:

In 1832, foreign iron imported, £159,222
In 1836, £252,702

The whole number of workmen employed in 1836 in mining operations and their consequences, in France, amounted to 273,364;

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while the total value of their labour amounted to £15,107,392, or 73,724,072 dollars.

Iron in Belgium. In 1837 there were in activity 23 high furnaces using coke, and 66 charcoal furnaces, in all 89, making about 147,640 English tons. The high furnaces are now increased to 43.

The following statement, partly derived from Mr. Virlet's estimate, and partly from the corrections of Mr. H. Clarke, and some modifications introduced by the present writer, shews an approximation to the annual iron manufacture in Europe.

	Estimate of Tons.
England, (1839,)	1,512,000
France, do.	600,000
Russia,	150,000
Sweden,	120,000
Austria and Prussia,	200,000
Hartz Mountains,	70,000
Belgium,	150,000
Elba, Italy, Sardinia, Piedmont,	70,000
Spain, Norway, Denmark,	46,000
Bavaria, Saxony, Hanover,	26,000
Poland, Switzerland,	12,000
	2,956,000

or in round numbers three millions of tons of iron annually made.

NORTH AMERICA.

British Provinces—now the United States.

Iron, on the authority of Mr. Scrivenor's History of the Iron Trade, was first made in America in the then province of Virginia, about the year 1715. The example was quickly followed by Maryland and Pennsylvania; and "this opening of a new source of wealth was a subject of great satisfaction and importance to those who were interested in the prosperity of the colonies; presenting to their view, at no distant date, a prospect of independence of foreign countries for the supplies of those most essential articles, iron and timber." A writer of that day states that "they have ironstone all along the continent, from the southernmost part of Carolina to the northernmost part of New England, in great plenty"—"and had we a full supply of it (iron) from our plantations, we might not only

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ballast our ships with it, but export great quantities to Portugal, the Straits and Turkey, and even to Africa and India."

This impression continued to strengthen; and in 1750 an act was passed for encouraging the importation of pig iron from the British colonies in North America. The House of Commons brought in a bill "that pig iron made in the British colonies in America, may be imported duty free, and bar iron into the port of London." This bill, which subsequently received the royal assent, in order that the colonies might not interfere with the manufactures of their mother country, contained the following prohibitory clause:—"That no mill for slitting or rolling of iron, or any plating forge, to work with a tilt hammer, or any furnace for making of steel, shall be erected or continued in any of his majesty's colonies of America."

The states having separated from, and established their independence of the mother country, these regulations of course terminated. The making of pig iron has been gradually increasing and keeping pace with a rapidly augmenting population; and with the recent improvements in the process, will, no doubt, be soon fully equal to the demands of the entire country.

We have but scanty information as to the amount of iron now made in the United States, but have introduced the foregoing notes, inasmuch as they are not without interest at the present day.

Iron in Pennsylvania. We have at hand no tables or returns of the amount of iron manufactured in this state, and it is probable that none exist which would exhibit the recent known increase in that important branch of manufacture. In 1830 the make was estimated at 191,536 tons of pig iron, in 239 furnaces, in the whole of the United States, which quantity was supposed in 1837 to have increased to 250,000 tons, according to Mr. Lea. By the report to Congress on the subject of a National Foundery, it appears that in 1838 there were 102 furnaces and rolling-mills situated within a circle of fifty miles round Lancaster in Pennsylvania. Such, however, is the enlarged demand, notwithstanding the augmentation of the home production, that the official returns of iron imported into the port of Philadelphia, shew a gradual increase since the year 1834.

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TABLE XVIII.

Comparative statement of the gross amount of Iron (comprising rail-road, bar, sheet, hoop, rod, pig, scrap, castings, chain cables and anchors,) and of Steel imported into the District of Philadelphia, for eight years, from 1832 to 1839, inclusive.

Years.	Iron, chiefly Rail-road.		Steel.		Anvils, nails, spikes, hammers, sledges, and wire.		Total of Iron and Steel.	
	Tons.	*Cwt.*	*Tons.*	*Cwt.*	*Tons.*	*Cwt.*	*Tons.*	*Cwt.*
1832	9,063	4	280	16	146		9,490	
1833	16,111	17	391	0	122		16,624	17
1834	10,661	11	197	8	106		10,964	19
1835	3,574	19	232	8	130		3,937	7
1836	8,378	15	379	0	228		8,985	15
1837	8,034	16	356	18	126		8,517	14
1838	9,243	16	197	9	208		9,649	5
1839	11,063	9	241	7	264		11,568	16
In 8 years,	76,132	7	2,276	6	1,330		79,738	13

Iron in the East Indies. The smelting and refining of iron, although in a very rude method, is carried on with increasing activity in India, and sells in the bazaars for less than a penny a pound; or about £9 per ton.

(F.)

Relative density of different species of Coal.

In a preceding note we have taken occasion to exhibit by means of an explanatory Table (XI.), the relative amount of carbon and of volatile matter determined to exist in the coal of the principal bituminous beds of England, Scotland, Wales, and the United States of America, and the comparative adaptation of those coals to manufacturing purposes, particularly that of iron. We now offer another method of drawing useful comparisons between the coals, whether bituminous or non-bituminous, in Europe and North America, by means of a table which shews their respective specific gravities and their weight per cubic yard.

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TABLE XIX.

Localities.	Density.	Weight of a cubic yard. Tons.	lbs.
BITUMINOUS COAL.			
United States.			
Wheeling,	1.230	0	2075
Richmond, Chesterfield,	1.246	0	2102
Kenawha, Salines,	1.250	0	2109
Karthaus,	1.263	0	2131
Pittsburg,	1.265	0	2134
Illinois, Rockwell,	1.273	0	2146
Mercer county, Pennsylvania,	1.275	0	2151
Stony Creek, 6 mile openings,	1.330	1	0004
Farrandsville,	1.339	1	0017
Philipsburg, old mines,	1.358	1	0052
Stony Creek, Yel. Springs, No. 3,	1.361	1	0056
Stony Creek, Rausch Gap, Pitch vein,	1.387	1	0100
Stony Creek, Yel. Springs, Backbone vein, No. 1,	1.389	1	0103
Stony Creek, Yel. Springs, Kugler vein, No. 2,	1.391	1	0107
Stony Creek, Yel. Springs, at 276 feet,	1.395	1	0111
Stony Creek, Rattling Run, Perseverance,	1.391	1	0107
Stony Creek, Big Flats,	1.395	1	0111
Stony Creek, 6 mile openings, (Bull,)	1.396	1	0116
Blossburg, Tioga, Coal Run,	1.371	1	0073
Do. Johnson's Run,	1.493	1	0280
Do. Bear Creek,	1.000	1	0122
Do. New Hope vein,	1.429	1	0173
Stony Creek, Cold Spring vein,	1.403	1	0127
Tennessee, Cumberland mountains,	1.450	1	0207
Stony Creek, Rausch Gap, Heister vein,	1.454	1	0213
Philipsburg, Centre mines,	1.500	1	0291
Cumberland, Frostburg, av. of 3 veins,	1.552	1	0379
Broad Top Mountain, Bedford county,	1.700	1	0629
England.			
Newcastle, Cherry Coal,	1.266		2136
Do. Caking Coal,	1.270		2143
Do. another,	1.280		2159
Wigan, Cannel Coal,	1.275		2151
Liverpool, Cannel Coal,	1.319		2226
Durham, Caking Coal,	1.274		2150
Scotland.			
Wylam? Splint Coal,	1.302		2197
Glasgow, do.	1.307		2205
Edinburgh, Cannel Coal,	1.318		2224
Glasgow, Cherry Coal,	1.268		2133
Silesia,	1.263		2131
	1.270		2143
Belgium.			
Basin of Mons, Plate vein,	1.263		2131
do.	1.275		2151
do.	1.287		2171
Do. Veines à deux lais,	1.262		2130
Do. Veine à bouleau,	1.264		2133
Brazil—Bituminous Coals,	1.289		2175
Earthy Coals,	1.483	1	0262

Localities.	Density.	Weight of a cubic yard. Tons.	lbs.
ANTHRACITE.			
United States.			
Lyken's Valley,	1.318	0	2284
	1.327	1	0000
Mahanoy, West,	1.371	1	0073
Stony Creek, Bl. Sp. Gap, Grey vein,	1.379	1	0087
Do. do. do.	1.395	1	0111
Do. do. 4 feet vein,	1.528	1	0338
Lorberry Creek, Big vein,	1.472	1	0244
Pottsville, Sharp Mountain vein,	1.412	1	0142
Pottsville, Peach Mountain vein,	1.446	1	0200
Pottsville, Salem vein,	1.574	1	0409
Wilkesbarre, best Coal,	1.472	1	0244
Lehigh, Mauch Chunk,	1.550	1	0375
Do. Nesquehoning,	1.558	1	0406
Hazelton,	1.550	1	0375
Tamaqua,	1.600	1	0460
Beaver Meadow, Wetherley vein,	1.600	1	0460
Girardville,	1.600	1	0460
Broad Mountain,	1.700	1	0629
South Wales.			
Swansea,	1.263		2131
France.			
Lanton, near Grenoble,	1.072		1809

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One fact is rendered apparent by a perusal of the foregoing table—that the bituminous coals of the United States are considerably heavier than those of Europe. With the exception of the Richmond coal, and the fat coals west of the Alleghany mountains, all the American coals exceed one ton in weight to the cubic yard. We have no instance of a bituminous coal which reaches one ton per cubic yard in Europe.

In the same proportion, and even more remarkably, do the American anthracites exceed in density those of which we have any knowledge in Europe. The American true anthracites all exceed one ton in weight per cubic yard, but we know not an example of any attaining to that weight in Europe.

(G.)

Comparative analysis of Coals.

There is yet another mode which has been employed to compare, with still greater delicacy, the respective qualities and composition of the varieties of European and American coals. This is by means of the relative proportions of carbon and gaseous matters, ascertained more completely than is exhibited in the usual form of analysis adopted in a foregoing table. For a knowledge of these results, and some others to which we may have occasion to allude, we are indebted to the work of M. Pelouze on Gas.* We are not aware that this masterly publication has appeared in the English language; and under that persuasion we feel the less hesitation in introducing here some tables and preliminary remarks, in connection with this investigation.

"All the *compact coals*, even the fattest, the most coking, the most inflammable,—in a word, those which the English designate by the name of "*close burning coal*," and which yield to distillation a coke, always more or less abundant, denser, and of better quality than those of the light coals, ought to be avoided for the manufacture of gas, if those which have properties more particularly adapted to this purpose can be procured.

"But among the eligible coals, how many distinctions still remain to be made. We are often astonished to find that the lightest coal—that which leaves the least residuum after its combustion—above all,

* Traité de l'éclairage au Gaz, avec 24 planches, par Pelouze pere. Paris, 1839.

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that which possesses characters entirely bituminous, which kindles rapidly, and gives out a fine, abundant and elongated flame, yields much less gas to distillation than some other variety of the light coals which possess the same apparent characteristics, or which were even far from promising as much.

"It does not appear unreasonable to attribute this difference to the presence of oxygen more or less abundantly, in the composition of the coal. We perceive, in fact, that there, where the oxygen predominates in comparison with another coal, more water and oxide of carbon will be formed in the process of destructive distillation, and consequently less of carbonated hydrogen.

"We are acquainted with a great number of analyses of coal, made at various periods; but all at a time when the science of the analysis of organic bodies had made little advances. Besides, the only object of those analyses was that of stating the respective proportions of coke or de-bituminized coal and the incombustible residuum which the coke yielded by a complete incineration. Little attention was given to determining the component parts of the bituminous portion. Consequently, we shall say nothing of the analyses of Kirwan and Thomson. We shall not even refer to any of those numerous statements which Karsten has given us of the combustible minerals of Prussia. The combustibles upon which this skilful metallurgist has operated, are besides foreign to those of France, or of the countries which supply us: at best they could only offer us conclusions drawn from analogy.

"Quite recently, an Englishman, Mr. Thomas Richardson, has devoted himself to similar researches in the laboratory of Professor Liebig, at Giesen. He has examined the English coals. These are already used by us, and will probably be much more so before long.

"We give then the results of the analysis of Mr. Richardson, the more willingly that his examinations have been directed to the produce in coke, and to the elements of the bituminous portion, which being the special object of our publication, are rendered more interesting to us."

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British Bituminous Coals.

TABLE XX.

Species of Combustible.	*Locality.*	*Composition.*				*Composition after deducting the ashes.*		
		Carbon.	Hydrogen	Oxygen.	Ashes or Cinder.	Carbon.	Hydrogen	Oxygen.
Splint Coal,	Wigan, (Wylam?)	74.823	6.180	5.085	13.912	86.91	7.18	5.91
	Glasgow, - -	82.924	5.491	10.457	1.128	83.87	5.55	10.58
Cannel Coal,	Lancashire, -	83.753	5.660	8.039	2.548	85.94	5.81	8.25
	Edinburg, - -	67.597	5.405	12.432	14.566	79.13	6.33	14.54
Cherry Coal,	Newcastle, - -	84.846	5.048	8.430	1.676	86.29	5.14	8.57
	Glasgow, - -	81.204	5.452	11.923	1.421	82 38	5.53	12.09
Caking Coal,	Newcastle, - -	87.952	5.239	5.416	1.393	89.19	5.31	5.50
	Glasgow, - -	83.274	5.171	9.036	2.519	85.43	5.30	9.27

With the certain means that chemists possess, now-a-days, for analysing organic substances, such a work, published by a person so competent in these matters, ought to inspire confidence. Now we see that in the bituminous portion of the coals assayed by Mr. Richardson, the proportion of oxygen varies from 14.54 for 6.33 of hydrogen, to 5.50 for 5.31 of hydrogen. There is, therefore, reason to think, that in the distillation of the first variety, in consequence of the formation of water, there would remain very little hydrogen for the production of gas for illumination; while the second variety would have yielded a much more abundant result of carbonated hydrogen gas.

At the same time that Mr. Richardson was operating at Giesen, M. Reynault, an aspiring mining engineer, was devoting himself at Paris to similar researches, with much assiduity. We give below the principal results which he has obtained.

European Bituminous Coals.

Analysis per cent., the earthy residuum being previously abstracted. The results shew the mean of three different assays for each species of coal.

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TABLE XXI.

Localities.	Carbon.	Hydrogen	Oxygen.
1. Coal of Alais, basin No. 23, mine of Rochebelle, France,	90.55	4.92	4.53
2. Coal of Lavaysse, Dep. of the Aveyron, - - Do.	82.12	5.27	7.48
3. Coal of Mons, 1st variety of *Flenu*, - - - Belgium,	86.49	5.40	8.11
4. Do. 2nd do. do. - - - Do.	87.07	5.63	7.30
5. Coal of Epina, basin No. 11, - - - - - - France,	83.22	5.23	11.55
6. Coal of Blanzy, No. 10, - - - - - - - Do.	78.26	5.35	16.39
7. Cannel Coal of Lancashire, - - - - - - England,	85.81	5.85	8.34
8. Coal of Commentry, basin No. 13, - - - - France,	82.92	5.30	11.78
9. Coal of Rive-de-Gier, do. No. 20, Grande-Croix, Do.	89.04	5.23	5.73
10. Do. do. do. do. Rassaud, Do.	89.07	4.93	6.00
11. Do. do. do. do. Corbeyre, Do.	90.53	5.05	4.42
12. Do. do. do. do. Cimetiere, Do.	85.08	5.46	9.46
13. Do. do. do. do. do. Do.	87.45	5.77	6.78
14. Do. do. do. do. Couzon, Do.	84.49	5.75	9.36
15. Do. do. do. do. do. Do.	86.30	5.27	8.43
16. Coal of Noroy, basin No. 3, Vosges, - - - Do.	78.32	5.38	16.30
17. Coal of Oberkirchen, - - - - - - - - Westphalia,	90.40	4.88	4.72
18. Coal of St. Girons, Dep. of L'Arriege, - - France,	76.05	5.69	18.26

We remark how much the proportions of oxygen in relation to the hydrogen, vary, even in their most extended limits: and if we admit that the abundance of the first is injurious to the production of gas for lighting, all the uncertainty which is generally observed in the result of the manufacture is explained.

Many of the coals comprised in the preceding table are defective by an absolute want of hydrogen; but several others, even those rich in hydrogen, by the association of that with a too strong proportion of oxygen, which in the distillation of coal disengages itself with the hydrogen, both being in a nascent state, are found in conditions favourable to combination; that is to say, to the production of water, to the detriment of the quantity of illuminating gas.

Anthracites.

TABLE XXII.

Localities.	Carbon.	Hydrogen	Oxygen.
1. Anthracite of Pennsylvania, - - - - - United States,	94.89	2.55	2.56
2. Coaly Anthracite of Rolduc, near Aix-la-Chapelle, - - - - - - - - - - Belgium,	92.85	3.96	3.19
3. Anthracite of Mayenne, - - - - - - France,	93.56	4.28	2.16
4. Do. of South Wales, - - - - - Wales,	94.05	3.38	2.57
5. Do. of La Mure, Dep. of Isere, - - France,	94.07	1.75	4.18
6. Do. of Macot, - - - - - - - - La Tarantaise,	97.23	1.25	1.52

We here perceive that the anthracites are absolutely wanting in hydrogen, independently of the consideration of oxygen. It ex-

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plains then very well why this species of combustible is the least convenient substance for the manufacture of illuminating gas.

(H.)

Miscellaneous notes relative to the principal qualities of Coal in Europe.

In the United States the subject of coal has so recently occupied the attention of the community, as forming one of its most important resources, that we have scarcely had time to make comparisons with similar combustibles in Europe. Nor have we possessed more than a very meagre amount of information relative to the economic and commercial value of these substances in other countries. The present is not the occasion to enter so largely into those details as they merit; but we cannot refrain from condensing some few facts on this extremely interesting subject.

While in the new world the most simple properties of coal have scarcely been known half a century; while the first anthracite that found its way from Pottsville to Philadelphia was in the year 1812; the first from Mauch Chunk and the Lehigh in 1814; the first bituminous coal that reached tide from Clearfield county down the Susquehanna was in 1804; the first anthracite dug in the Wyoming region in 1776; the first trial of it as fuel in a grate was in 1808; and the first coal that appeared in the market in Philadelphia was in 1820; the coals of England had been employed for fuel and manufactures from the beginning of the thirteenth century; and the coal mines of Belgium had been in operation as early as the year 1198. Yet the amount of information as to what has been effected in other parts of the world, particularly that resulting from the examinations in our own times for scientific and economic purposes, is by no means so familiar here as its importance demands. We think, therefore, that we may render some slight accession to the current knowledge on coal, by appending to the present document some few additional notices thereon; and we shall draw largely for that purpose from the work we have already quoted, as well as from other public and private sources.

In the first place we shall advert to the coals of

GREAT BRITAIN.

It is estimated that the mines of Great Britain furnish no less

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than seventy varieties of coal. The district of Newcastle alone sends forty-five different varieties to London.

We have already shewn, that as regards their adaptation to the purposes of making iron, these coals naturally form themselves into three principal classes. It will be perceived that for other economic uses something like such an arrangement presents itself. And in the first place with regard to their adaptation to the *manufacture of illuminating gas.*

Class 1. In this class the type of perfection is the *Scotch cannel;* then comes after it the *Lancashire cannel;* and in the third order the *Yorkshire cannel.* This cannel coal can be assimilated in many respects to the coal of the basin of Mons in Belgium. The coal of Wigan in Lancashire, and almost all that which is worked on the western side of England, belong to the class of blazing coals, among which the cannel coal holds the first rank; and there is also a little of this species in the mines of Newcastle. The *splint coal* of Scotland is only a coarse variety of cannel coal, as are the greatest part of all the Scotch coals.

The results, according to the English Engineer, Luke Hebert, obtained from a series of experiments made upon each of the three classes of English bituminous coals, and in each case by the distillation of one ton of the coal, are as follows:

1. Cannel coal of Lancaster produced 11,600 English cubic ft. of gas.
2. Coal of Newcastle, (Hartley mine,) 9,600 do.
3. Coal of Staffordshire, best quality, 6,400 do.

The coke obtained was not abundant; of very bad quality, and almost of no value; but the gas was rich and easy to purify.

The coals of Newcastle, so called because they are for the greater part shipped from that neighbourhood, come from the counties of Durham and Northumberland; they have a great resemblance to the coals of Anzin, of St. Etienne, and Rive-de-Gièr, (basin No. 20.) Those of Staffordshire and of a part of Wales can even be assimilated, to a certain point, to the coals of Auvergne and a part of the south of France.

Class 2. Comprehends the varieties of coal that cement in the fire; the fattest of which form the "strong burning" or "close burning coals." They contain less bitumen and more of carbon than the cannel coal. The residuum after combustion is less voluminous, but it constitutes a grey hard coke, which, in burning afresh, aided by a mixture of new coal, produces a very intense heat, and is a valuable coke for an infinity of purposes.

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By experiments on a similar scale to the last, were obtained the following results.

1. Wallsend coal,	10.300	cubic feet of gas.
2. Temple Main,	8.100	do.
3. Primrose Main,	6.200	do.
4. Pembrey,	4.200	do.

The gas obtained possessed an illuminating power much inferior to that from the coal of the first class; but there was much coke of good quality.

In this class the series terminates with the drier and less adhesive coals, called "open burning coals." Those of this kind are preferred by blacksmiths because they better bear the blast of the bellows.

Class 3. The coals of this class are almost entirely deprived of bitumen. Those of Kilkenny and a part of the Welsh coal basin belong to it. The culm of Glamorganshire is a very light coal, of a very loose texture, very glossy, and composed of capillary fibres arranged in divergent rays; it burns easily, makes a lively fire, and is in great request in Cornwall for the smelting of copper.

There is in England another variety of coal, called *flint coal*, because it is almost as hard as flint, and its fracture is as shining as that of glass. The *flew coal*, of the mines of Wedgebury in Staffordshire, belongs to this series. In Cumberland, at Alston Moor, a variety of coal is found without bitumen, called *crow coal*, which approaches to the French coal of Fresnes.

These coals are composed for the major part of carbon, chemically combined with different earths and metallic oxides. In England they are never subject to distillation, the amount of gas yielded being extremely small.

ANTHRACITE occurs extensively in *South Wales*, passing at the eastern extremity of the basin into the dry bituminous coal previously mentioned. In the *Isle of Arran* the same facts are stated to exist. In some of the rich bituminous coal mines of *Silesia* occur portions which are supposed to be anthracite. The coal beds of *Fresnes* (department of the north) inclose also much anthracite.

Anthracite in France. The number of mines actually in operation was recently thirty-seven. Two of these are situated at the north-east extremity of the great coal basin of the *Loire*. The price per quintal at the mines was 0 fr. 68 cts.

There are several thick beds which are worked by the method

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termed by the miners "*methode en travers*;" but the working instead of proceeding from low to high, is directed from high to low. This anthracite is used for domestic purposes, for nail factories, and for burning lime and plaster.

In the department of the "*Hautes alpes*," are ten anthracite mines. These employ scarcely any other workmen than the owners, ("concessionaires,") or individuals of their families. It is during winter, and when they are not occupied in their fields, that they work their mines. Thus the price of anthracite (0 fr. 50 cts. the quintal) is lower than any where else. It is little more than the representation of the value of labour.

In the department of Mayenne and Sarthe are ten anthracite mines, worked by shafts. These deposites are irregular; in lenticular masses, never much prolonged. It is almost exclusively employed in the burning of lime, a substance of increasing use and value among the farmers of the surrounding country. The price of anthracite at the mines is 1 fr. 69 cts.

In 1835 the 24 mines (concessions) of anthracite produced 682,271 quintals.
1836 „ „ 606,349 „

Between Ebreiul and Charbonniers in Auvergne, is a dry coal analogous to anthracite. Sometimes anthracite occurs in nodules (rognons) even in beds of bituminous coal; also in foliated masses in many of the bituminous collieries of France.

The anthracitous or dry coals of the south of France, and from some formations of calcareous strata, are very analogous to those which the English call the Kilkenny, the Welsh, and the stone coal.

In the Alps, at Mount St. Bernard, the anthracite is accompanied with bituminous schist, containing numerous vegetable impressions.

In *Savoy*—in *Italy*—in *Bohemia*—in *Saxony* and in *Norway*, anthracite is worked.

In *Spain*—in the Pyrenees—and near Oviedo, very fine anthracite occurs.

Review of the Bituminous Coal Fields of Europe.

FRANCE.

Coal occurs in France under a variety of geological circumstances, independent of the ordinary coal formations. Among others we have examples of its presence

In *argillaceous schiste*, alternating with granitoid psammites.

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By this term is understood those rocks which are designated granitoid sandstone, granitic sandstone and coal sandstone.

In sandstone, at Wehrau in Alsace.

In limestone, at La Corniche, near Roquebrunne.

In schist, at Oris, department of Isere.

In or upon gneiss, at Venasque.

In or upon granite, in Auvergne—dry coal.

We have before us the details of the 46 bituminous coal basins in France, describing the nature of the coals, the number of veins and mines or concessions, and the price of coal per quintal at the mine in each locality. These details would occupy too much space here.

The mean price of coal at 157 mines or concessions in the various coal basins of France, in 1836, was 0 fr. 97 cts. per quintal, or 18*s.* 5*d.* per ton, and of charcoal, 54*s.* 10*d.* per ton.

The total number of collieries and anthracite and lignite mines was 320. The number of steam engines employed on them 267.

In 1835 the quantity of coal mined in France and imported thereto amounted to - - - - - - - - 27,366,625 quintals.
In 1836 the combustibles produced in France were - - 28,419,466 quintals.
Balance of imported and exported coal 9,450,803 do.
————in all 37,870,269 do.

While in 1816 it was only 7,764,318 metrical quintals of coal.*

BELGIUM,

Province of Hainaut, contains three basins. The two basins of Mons recently employed 23,000 workmen, and now employ a greater number. The coal varies, according to the nature of the beds, from the meagre or dry quality even to the fat or caking coal. The number of coal beds is about one hundred and fifty, of which one hundred and twenty-six are worked. Number of steam engines for pumping, seventy-five in operation.

The basin of the *Couchant de Mons* contains three distinct species of coal. These are

1. The coal called *flenu*, burns rapidly with much flame and smoke; does not produce a very intense heat during combustion, but gives out a disagreeable odour.

2. The *fat coal* divides in cubes, is more friable than the *flenu*, giving less flame and smoke, but produces a more intense heat.

* 10,1465 metrical quintals are equivalent to one ton.

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Used in forges, the fabrication of coke for the founderies, and for domestic uses—burns slowly, swelling in burning.

3. *The meagre, lean or dry coal*, more friable than the preceding, does not coke in the fire, because it contains not sufficient bitumen; and is unfit for the purposes of gas lighting, but adapted for the burning of bricks and lime.

The three classes of coals here described, do not pass abruptly from one to the other, but on the contrary proceed insensibly. Those beds which are the type of the quality (No. 1) called *flenu*, form the first or highest in the order of superposition. They acquire the quality of *fat coal*, (No. 2,) as they approach the lower part of the basin. In the same way these fat coals pass to the quality of *thin or dry coals*, (No. 3,) of which the type is in the lower beds next the bottom of the basin.

Province of Liege, contains more than 240 mines in activity, all very rich. It is estimated that there are 61 beds of coal at one point in this basin. According to M. Genneté the greater or less thickness of the earthy or stony beds situated between seams of coal, has no influence upon that of the coal itself. The same with regard to the good or bad qualities of the coals: there is no relation or affinity with the different depths in the series from whence they are taken. For example—the best coal extracted is from the 4th, 7th, 10th, 11th, 15th, 17th, 18th and 22nd seams. Thus in the lowest veins, as well as those in the middle, and those nearest the surface, are found the equal gradations of very good, middling and bad coals.

Near Aix la Chapelle are several coal mines, but the coal possesses very little bitumen, and is very pyritous.

The price of coal has greatly increased in Belgium of late years.

	In 1836.	In 1837.
Mons,	7 to 8 francs per tonne.	12 and 14 francs per tonne.
Charleroi,	13 and 14 do.	18 and 19 do.

One of the heaviest charges on coal in Belgium is the scarcity and consequent high price of the timber required to support the mines in the process of working.

GERMANY.

There are bituminous coal mines in Zwichaw; in the environs of Marienburg in Mismè; in the principality of Anhalt in Bernbourg; in the circle of the Upper Rhine; at Ai near Cassel; at Plaven in

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Bohemia; in the environs of Toplitz; in the county of Glatz; in Silesia at Gablon, &c.; in the Dutchy of Scheidnitz; in the Haut Palatinat; in the Bas Pallinat; at Votschberg; at Luim, in Styria proper; at Rhene, &c. &c.; Gibienstein and Seefeld in Saxony, &c.; at Wetten, north of Halle, &c.

In Siberia, in *Spain*, it occurs in several provinces—in Poland, in Italy, China, Sumatra, Madagascar, &c.; in *Saint Domingo*, in *Jamaica*, in Cumana, New Andalusia.

IRELAND.

The coal formations occupy a large portion of the surface of Ireland, notwithstanding which there has always been a large importation of bituminous coal from England and Wales.

That of Castle-Comber, 60 miles south-west of Dublin. This coal burns with extreme facility, and without producing smoke; but it is full of sulphur, and gives a blue flame, with an odour very pungent from sulphuric acid. Another position is that of Ydof in the province of Leinster. This was the first coal which was discovered in Ireland, and is so abundant as to supply all the neighbouring provinces. This coal is very heavy, burning in the manner of charcoal, but maintains the fire much longer. In the county Antrim, extensive bituminous coal fields exist on the sea coast, having seams of nine feet in thickness.

SCOTLAND.

At Carron three beds occur of this combustible. The central seam is three or four feet thick. The upper part consists of a hard and compact coal, making a clear and agreeable fire. This quality is sent to London, where it is preferred to the Newcastle coal, for warming apartments. The middle part of the seam is of a less compact character; the coal is foliated and separates in leaves like schist. This coal, which the English call the *clod coal*, is used in the forges. As for the lower bed here, it forms a very compact coal, and is often slaty in the neighbourhood of the *wall*. This sort is all consumed in the country itself.

Near Edinburgh the coals have much resemblance to that of Newcastle, but are yet inferior in quality; being much less bituminous, and suit less for the forge. Here we have two coal fields—that of Mid-Lothian and of East Lothian.* Here are between 50

* Memoir on the Mid-Lothian and East Lothian Coal Fields, by David Milne, Esq.

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and 60 coal seams, exceeding a foot in thickness, and not more than thirteen feet thick; averaging about three feet and a half. In these basins are three or four species of coal; the most easily distinguishable being the *splint*, the *cubical or cherry coal*, and the *parrot coal*. The Mid-Lothian field is traversed by faults and trap dykes. The coal, when in contact with these dykes, presents the usual phenomena of "having much of its bituminous qualities *expelled*, and of the sandstones, shale, and other strata, being *hardened*."

"The thickness of all the known workable seams is 183 feet. The uppermost series comprises twenty-five yards of coal, extending over ten square miles. Now, as thirty-six cubic yards of coal weigh about thirty-two tons, and as there are 3,097,600 square yards in a square mile, a square mile of coal, twenty-five yards thick, would contain about 77 million tons. So that this upper or Brunstain group of coals must contain not less than 710 millions of tons."

In the lower group, Mr. Milne calculates there are *five thousand millions* of tons more. After making an allowance of one-half, and another allowance for the coal that has been already worked out, there will still be left 2250 millions of tons. "The annual home consumption of coal in Great Britain, is at present about thirty millions of tons, at the maximum estimate, so that there is enough in the East Lothian and Mid-Lothian coal fields to supply the whole nation for seventy-five years." The quantity of coal annually raised here is estimated at 390,000 tons.

SOUTH WALES.

Each square mile of this basin has been estimated to contain thirty-six millions of tons, the main bulk of which consists of non-bituminous coals, and the remainder of dry coking coals. The whole area probably contains about thirty thousand millions of tons, although one authority has carried his estimate as high as 43,000 millions, and another 64,000 millions, of which a comparatively very small portion has yet been mined. At the smallest named amount, and at the highest named quantity of consumption and exportation in Great Britain, (30 millions annually,) there yet remains a supply for full a thousand to fifteen hundred years for the whole nation, from this single coal field.

At the present time, for the mining service of this district alone, above 300 miles of surface rail-road and tram-roads are in use, and considerably more than that number are in the underground operations.

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ENGLAND.

Coal Fields of Durham and Northumberland. From explorations recently made into the resources of this region, it appears that the coal beds not yet worked can furnish ten milliards (ten thousand millions) of tons of bituminous coals, equivalent to a supply from these alone, for all the consumption of Great Britain, according to its present demands, during five hundred and fifty years.

Mr. Taylor, colliery agent to the Duke of Northumberland, estimates the gross quantity of coal in these two fields, at more than 12 millions of tons per square mile. After deducting one-third for waste, there will still remain a quantity sufficient to supply the present vend from this region, (or 3½ millions of tons) annually, for 1,727 years.

Besides the coal basins we have alluded to, there are about sixteen others, all in activity, in different parts of England.

The number of individuals employed in the collieries of England is two hundred thousand. In London alone four thousand labourers are daily employed in unloading the coal which continually arrives in the coal brigs in the Thames.

In 1835 the actual amount of English coal mined was ascertained to be distributed in the following manner:

Consumption in the interior,	13,500,000	tons.
Exportation to foreign parts,	880,000	„
Do. to Ireland,	1,900,000	„
Consumption at the mines,	3,000,000	„
Total,	19,280,000	„

A quantity which, at the point of departure, represents about ten millions of pounds sterling, and which is probably doubled by the cost of transportation. If, as has been recently intimated, the amount is now not far from thirty millions of tons annually, the capital invested in the coal trade is increased in the same ratio.

We will only add one illustration of the scale in which the business of the country is conducted, chiefly in connection with its coal and iron.

There is at this moment a capital amounting to upwards of *two hundred and seventy-eight millions of dollars*, invested in rail-roads alone, exclusive of the far greater amount locked up in the numerous canals which intersect the island.

R. C. T.

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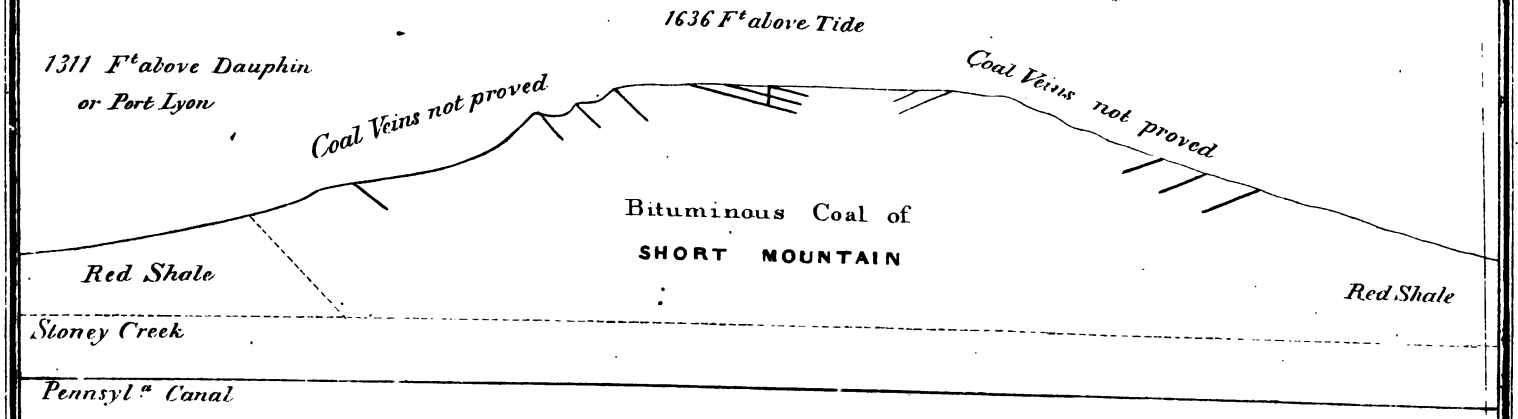
Fig. 1

SECTION OF THE BIG FLATS, 9 Miles



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